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A TREATISE

ON

CYSTOSCOPY AND URETHROSCOPY

BY

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TRANSLATED AND EDITED WITH ADDITIONS

BY

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NEW YORK

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WITH 217 FIGURES IN THE TEXT AND 24 CHROMOTYPOGRAPHIC PLATES OUTSIDE THE TEXT, INCLUDING 76 DRAWINGS FROM ORIGINAL WATER COLORS.

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PREFACE

The importance of urethral and vesical endoscopy is universally recognized. Physicians and surgeons are in constant need of the light shed by this science, which is one of the principal reasons for the existence of the modern urologist. But in order to apply the art skilfully and thereby derive all the advantages it is able to offer, it is necessary to attain considerable practice and skill in urethroscopy and cystoscopy.

Thanks to the perfection of modern instruments, it is easy to obtain clear and distinct pictures; on the other hand, it is often difficult to interpret the image which is presented, at first sight. For that reason, it is necessary to acquire considerable familiarity in practical endoscopy, in order to attain that indispensable experience which gives one a mastery of the subject and the ability to make a correct diagnosis.

This work is the result of fifteen years of practical endoscopy. Its object is to present to the medical profession the procedures and methods which have been so well perfected as to enable us to determine the condition of the urethral and the bladder mucosa, and also of the ureters, pelves and kidneys. Its object is to meet the needs, not only of students, who must be guided gently step by step into this wonderful science, but also of those who, though quite familiar with the practice of cystoscopy and urethroscopy, are not acquainted with all of its useful applications. Undoubtedly many urologists are thoroughly acquainted with the ordinary urethroscopic and cystoscopic technic; nevertheless, there are but few who fully realize all the advantages that can be derived from the most recent progress in urethroscopy and cystoscopy.

It is the purpose of this work to illustrate and popularize the science of direct vision cystoscopy and the marvelous applications which it renders possible. The treatment of prostatic hypertrophy endourethrally, the endovesical treatment of bladder tumors, the removal of foreign bodies from the bladder, and biopsy of the bladder, are just so many conquests, as yet too little known, and which it is well to make known to the medical world.

Since the onset of the present World War, scientific activity has

diminished everywhere, owing to the more serious duties with which scientific men find themselves preoccupied.

Doctor Wolbarst, of New York, who has undertaken to translate my work into English, and whom I have given sole authority, with the greatest pleasure, is perfectly qualified to do the subject justice; for the large experience which this well-known urologist has acquired in his specialty has fitted him perhaps better than anyone else to understand and interpret my work.

It has been a great satisfaction to me to know that in the work that he has done he has almost always reached the same conclusions and found the same therapeutic indications as I have in my own practice.

I am glad to state that this important translation which he has undertaken this year, has been brought up to date, and that the reader will find all the information necessary, not only as to the technic of cystoscopy and urethroscopy, but also in the therapeutic applications of these instruments.

The book consists of six chapters. Urethral and vesical endoscopy are first studied historically and in a general way. This is followed by a chapter on urethroscopy proper, and another on the use of urethroscopy in catheterization of the ejaculatory ducts and in the endoscopic treatment of prostatic hypertrophy. The remainder of the work, that is, its major portion, is devoted to the study of cystoscopy.

Cystoscopy in general, prismatic (indirect) cystoscopy, and direct vision cystoscopy are considered, not so much from the instrumental standpoint, which would only constitute a tedious recital, as from the point of view of the practical results obtained with the use of these instruments. The chapter on the cystoscopic appearance of the normal and pathologic bladder has been treated with special detail because of its very great importance. Direct vision cystoscopy is described in all its details in the succeeding chapter.

Further on, catheterization of the ureter with its technic, its indications, difficulties, and accidents is taken up fully; likewise the opportunities offered by ureteral catheterization, such as the search for ureteral calculus, the treatment of renal colic, the exploration of the renal pelvis, the treatment of pyelitis by pelvic lavage, also radiography and pyelography.

The next chapter considers the practical applications of cystoscopy; that is, the endovesical treatment of bladder tumors by galvanocauterization, the cold or hot snare, electrocoagulation, electrolysis and radium.

The last chapter is devoted to the treatment of foreign bodies in the bladder and of the cystites. There is also a consideration of the instrumental exploration of the lower end of the ureter and of vesical biopsy.

Particular attention has been given to the illustrations. The 247 illustrations in black together with the 24 colored plates appeal directly to the eye of the reader. In the study of endoscopy nothing is so important as to establish a clear, reliable picture in the mind's eye, so that the reader may remember it and be able to make a correct diagnosis in cases occurring in his practice.

With pleasure, I express to the publishers, Messrs. O. Doin & Son, gratitude for the care they have exercised in the publication of this work; I also thank M. Dupret, draughtsman, for the consummate art, as well as the untiring patience, which he has been so good as to exhibit in the detailed endoscopic work which was entrusted to him.

GEORGES LUYS

Paris, France.
January, 1918

TRANSLATOR'S PREFACE

This translation of Luys' work on "Cystoscopy and Urethroscopy" was undertaken with a twofold purpose in view: First, to bring to American and other English-speaking urologists the message which Luys' book bears; and secondly, to express in concrete form the love and affection which the translator feels for France.

This work was undertaken, in the first weeks of the great World War,—weeks in which the fate of glorious France and the rest of the civilized world hung in the balance. And when, as if by a miracle, Paris was saved and the invader's progress arrested at her very gates, and all lovers of France breathed once more, it seemed to be a sacred duty and a pleasure, as well, to bring this fine book by one of her greatest urologists within easy reach of his confreres in America.

Luys' work is frankly a plea in behalf of direct vision cystoscopy and urethroscopy. In America this method has not received the widespread and almost universal welcome that has been accorded the indirect method. Nevertheless, whatever the reason may be, it is felt that American urologists will welcome this thorough exposition of the direct method, so that they may at least compare it with the method with which they are more familiar.

Several features stand out strikingly in contrast with usual works of this kind: First, the extensive and illuminating historical data, showing the origin and development of cystoscopy and urethroscopy; secondly, the discussion of topics that are not strictly urologic, but closely affiliated, such as the sections on uterine cancer and pregnancy.

The translator has striven faithfully to transpose the author's lyric French into plain English,—frankly, a difficult task. There is always a fear of failure to express the author's exact meaning; but the effort has been made honestly, and it is hoped, successfully. No attempt has been made to alter the typical French character of the work. Whatever additions or amendments have been made, have been inserted either for the purpose of bringing the subject matter up to the minute, as it were, or in order to make the subject more practical for American readers.

I would take advantage of this opportunity to thank Dr. William E. Gould, and my staff assistant, Dr. S. Steiner, for valuable assistance

rendered in the translation; also Dr. William F. Braasch, of the Mayo Clinic, for his fine little article on "Direct Cystoscopy;" and lastly, but by no means least, The C. V. Mosby Company, that has undertaken the publication of the translation in this inauspicious time of high cost of production, simply, to use its own words, as its "contribution to France." It is a pleasure, as well as a privilege, to subscribe to that sentiment.

ABR. L. WOLBARST

New York City
May, 1918.

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CHAPTER I

HISTORY OF URETHRAL AND VESICAL ENDOSCOPY

HISTORY OF ENDOSCOPY

Ever since ancient times, physicians have made efforts to inspect the natural cavities of the body with special instruments. Even among the ancient Hebrews[1] the use of the vaginal speculum was already known; and in the surgical arsenal which was discovered in the excavations at Pompeii, instruments designed for the exploration of the rectum were found. Naturally, instrumental examination could be made only of the large body cavities which are easy of access, such as the mouth, vagina, and rectum. Efforts to penetrate a cavity with a lumen as narrow as that of the urethra or the bladder, were in vain, and the first solutions of this difficult problem began to show themselves only as we approach modern times.

Historically considered, it appears that endoscopy only goes as far back as the beginning of the nineteenth century, and it was Bozzini, of Frankfort, who in 1805 was the first to attempt the direct inspection of the cavities of the body. He constructed tubes of different shapes and lengths, chiefly for the study of the urethra. To illuminate the interior of his tubes, he employed reflected light; but this form of instrumentation was certainly too primitive and defective, and his fruitless efforts were quickly forgotten. Similar efforts of Fisher, of Boston, in 1824, met with equal lack of success.

Later, in 1826, Ségalas[2] presented to the Academy of Sciences of Paris a urethrocystic speculum, designed for the examination of the urethra and bladder. This, too, was soon forgotten. He employed two concentric metal tubes, the inner permitting a view of the bladder while the outer allowed the light from two candles to enter, the light being reflected by a concave mirror.

The real beginnings of endoscopy were made, however, in France, and should be put to the credit of Désormeaux, who in 1853, was the

first to examine the urethral and vesical mucosa in the living subject through an endoscopic tube in the urethra. The works of this author actually establish the beginning of endoscopic study, and he fully deserves the title of "Father of Endoscopy" which has been bestowed on him. He was fully justified, too, in writing on the covers of his treatise on endoscopy, this cry of triumph: "Nos quoque oculos eruditos habemus." (Cic.).

In 1865 he published an important work in which he made public the results of his experience.[3] Désormeaux's instrument consisted of a series of tubes of different calibers and lengths which were introduced into the urethra. The source of light was a petroleum lamp; the illumination was brought into the interior of the tube by a reflecting mirror pierced in its center and inclined to an angle of 45 degrees to the tube. This apparatus was based on the same principle as that of Bozzini.

Désormeaux's endoscopic researches became well known and attracted the attention of other investigators to such an extent that under this stimulus, similar efforts were soon multiplied in number; the first that appeared were those of Hacken[4] in 1862, and of Cruise[5] in 1865.

At that time, the principal aim was to increase the intensity of the light, in order to illuminate the lower end of the endoscopic tubes. With this object in mind, Furstenheim, of Berlin,[6] substituted gas for the petroleum light, and Andrews,[7] in 1867, and later Stein[8] employed a magnesium light.

Up to the time of Désormeaux, all the attempts to inspect the urethra and the bladder may be considered together; since his time, however, a clear difference must be established between those who devoted themselves especially to the study of the urethral mucosa and those who attempted to inspect the bladder particularly. It is therefore proper to make a separate study of the history of urethroscopy as distinguished from that of cystoscopy.

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[3]Désormeaux: De l'endoscopie et de ses applications au diagnostic et au traitement des maladies do l'urètre at de la vessie, Paris, 1865.
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[6]Furstenheim: Berl. klin. Wchnschr., 1870, Nos. 3 and 4; Oesterreich Zeitschr. für Jahresb. Heilkr., No. 25, 1870.
[7]Andrews: The Urethra Viewed by Magnesium Light, Med. Rec., New York, 1867, ii, p. 107.
[8]Stein: Das Photoendoscop, Berl. klin. Wchnschr., 1874, No. 3.

HISTORY OF URETHROSCOPY

Numerous models of urethroscopes have already been suggested, and although the list of existing instruments is a long one, it is still far from complete, and we must expect new ones to appear continually. We may classify all existing urethroscopes into two quite distinct groups: 1. Urethroscopes with external illumination; that is, whose source of light is situated outside of the urethroscopic tube. 2. Urethroscopes with internal illumination; that is, with the source of light situated inside of the tube.

Urethroscopes with External Illumination

This group itself comprises two distinct types of instruments: 1. Those in which the source of light is attached to the urethroscope. 2. Those in which the light is independent of the urethroscopic tube.

1. **Urethroscopes With External Illumination Attached to the Urethroscopic Tube.**—The first apparatus of this kind was constructed by Désormeaux, the originator of the method. Fig. 1 is self-explanatory. This primitive urethroscope was soon improved upon, for the

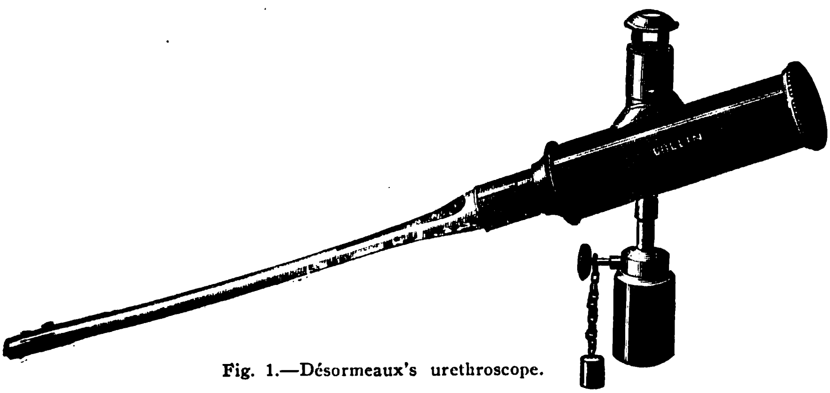

Fig. 1.—Désormeaux's urethroscope.

illumination which was furnished by an oil lamp and later by a petroleum lamp, was quite insufficient for its purpose. The electric light eventually gave to this method of examination the position it deserves. This important improvement to Désormeaux's urethroscope was contributed by Horteloup (Fig. 2).

In this same group of instruments must also be mentioned the following:

(a) The panelectroscope of Leiter (Fig. 3). This instrument consists of tubes of varying calibers and lengths, corresponding to No.

18 or No. 20 Charrière, which are introduced into the urethra by the aid of an obturator or stylet. Illumination is furnished by an electric lamp (B), placed in a semicylinder open on its upper sur-

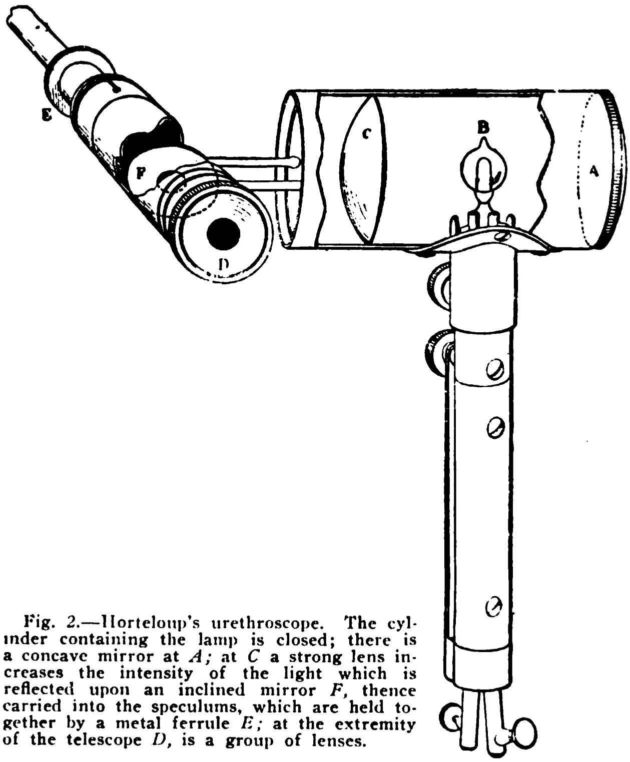

Fig. 2.—Horteloup's urethroscope. The cylinder containing the lamp is closed; there is a concave mirror at A; at C a strong lens increases the intensity of the light which is reflected upon an inclined mirror F, thence carried into the speculums, which are held together by a metal ferrule E; at the extremity of the telescope D, is a group of lenses.

face; the light is thrown upon the mirror (D), and thence reflected into the urethroscopic tube (A). A lens (C), which can be adjusted according to one's vision, magnifies the field, in order that one may see more

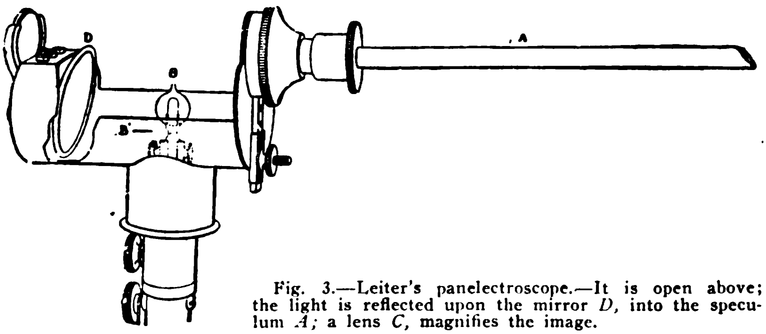

Fig. 3.—Leiter's panelectroscope.—It is open above; the light is reflected upon the mirror D, into the speculum A; a lens C, magnifies the image.

clearly at the distal end of the tube. This instrument has been again taken up by Heitz-Boyer, who presented it to the Surgical Society.[1]

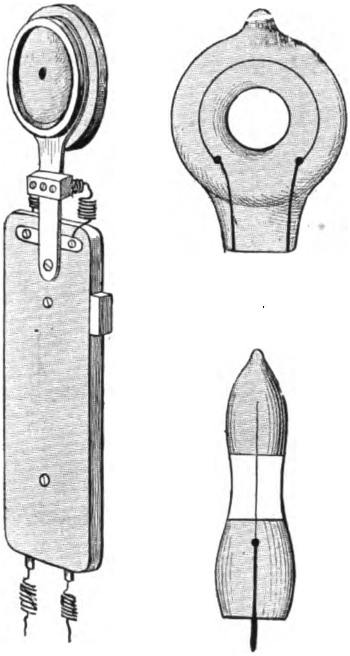

Fig. 4.—Schutze's diaphotoscope.

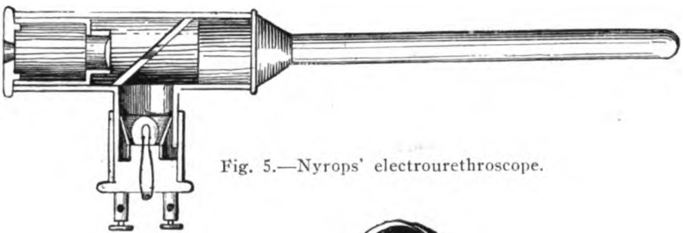

Fig. 5.—Nyrops' electrourethroscope.

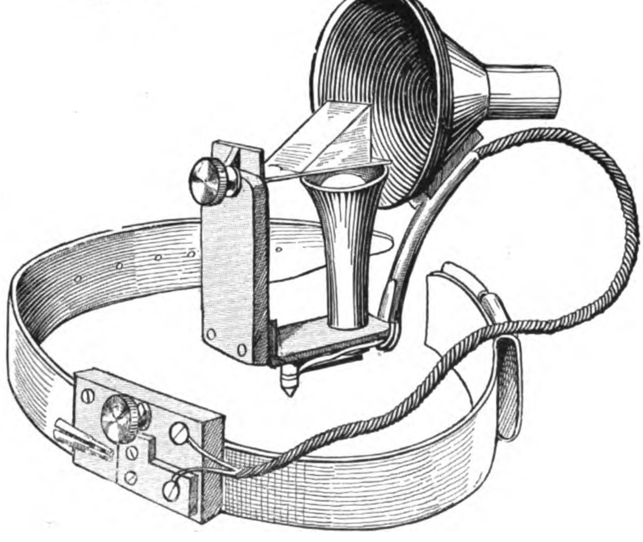

Fig. 6.—Lang's urethroscope.

The only important modification which has been made consists in the illumination which is similar to that which Brunning has applied recently to the esophagoscope.

Fig. 7.—Otis' urethroscope.

This instrument is open to the same criticisms which may be directed against all urethroscopic instruments having external illumination (see page 35). An attempt based on the same plan was made recently by Wyndham Powell,[2] who constructed a urethroscope with

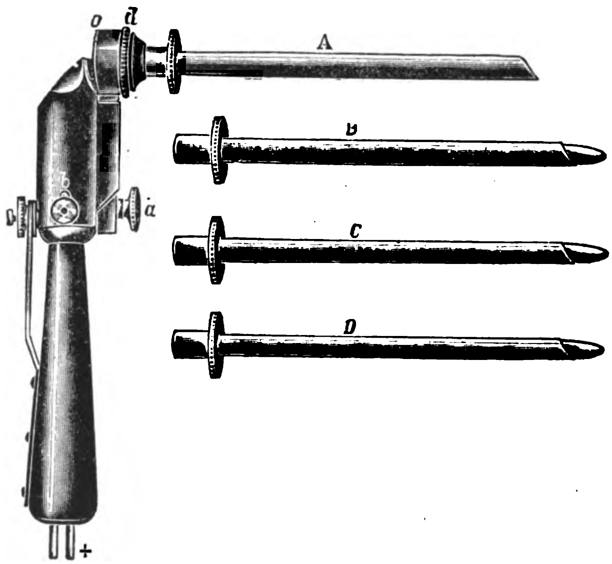

Fig. 8.—Casper's electroscope.

external illumination which provided parallel rays of light. With this instrument, examination of the urethral mucosa requires air dilatation.

Horteloup[3] gave up the use of Leiter's panelectroscope because of

its inconveniences and returned to the primitive instrument of Désormeaux, improved with an electric lamp.

(b) The diaphotoscope of Schutze (Fig. 4).
(c) The electrourethroscope of Nyrops (Fig. 5).
(d) The urethroscope of Lang (Fig. 6).
(e) The urethroscope of Otis (Fig. 7).
(f) The electroscope of Casper (Fig. 8).

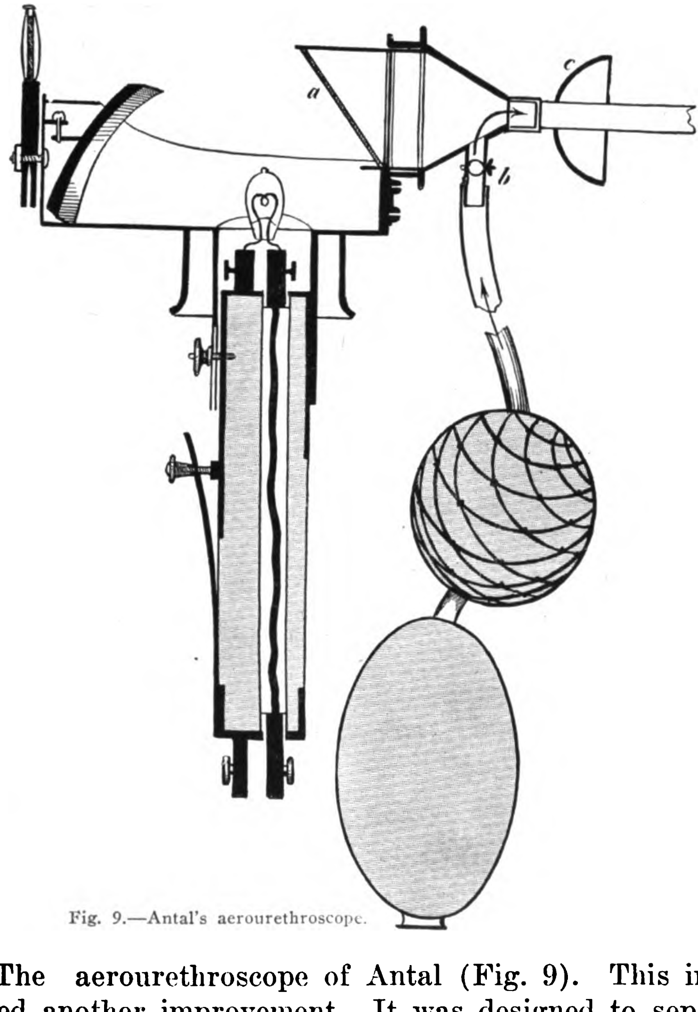

Fig. 9.—Antal's aerourethroscope.

(g) The aerourethroscope of Antal (Fig. 9). This instrument contributed another improvement. It was designed to separate and distend the urethral walls to their maximum extent. The urethroscopic tube is closed at its proximal end by a movable window acting like a valve, which permits air to be forced into the canal of the urethra by means of a bulb. During the examination, the window retains the air in the tube, without interfering with vision in the least; meanwhile an

assistant makes pressure on the urethra either at the level of the perineum or at the membranous urethra through the rectum. By this method the urethral walls are separated by the pressure of the air, and

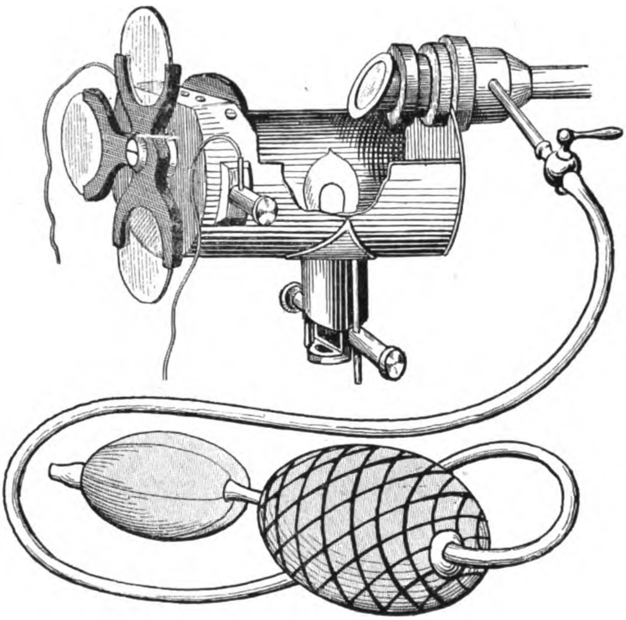

Fig. 10.—Fenwick's aerourethroscope.

can be examined over an area of several centimeters. Fenwick, of London, modified this instrument (Fig. 10).

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[1]Bull. de la Soc. de Chirurgie, Jan. 4, 1911, p. 38.
[2]Lancet, London, May 24, 1913, p. 1463.
[3]Horteloup: Urétrite chronique, Paris, Masson, 1892, p. 43.

2. **Urethroscopes with External Illumination Independent of the Urethroscopic Tube.**—Grünfeld, of Vienna, originated this method in 1881. He introduced a tube into the urethra and with the aid of a reflector, he projected rays of light into its lumen. This reflector, pierced with an aperture in its center, permitted the observer to examine the urethral mucosa. As a source of illumination, he used either the sun's rays, diffused daylight, the light of an oil lamp or gas, or finally, an electric lamp. The reflector was either supported by a handle held in the hand, or what was more practical, affixed to the forehead of the observer by a headband.

Clar's photophore (Fig. 11) constitutes a decided improvement on the frontal mirror of Grünfeld. It consists principally of an elec-

tric lamp placed in the center of a convex mirror which is attached to the forehead by a headband.

The urethroscopic tubes which Grünfeld employed were either straight (Fig. 12) or curved. He also used straight tubes with windows provided with a reflecting mirror (Fensterspiegelendoscop), Fig. 13. This instrument consisted of an ordinary metallic tube in the

Fig. 11.—Clar's photophore.

lateral wall of which was an opening of 1½ to 2 centimeters, covered with a little glass window. The urethral extremity of the tube was closed with a metallic tip, to which was attached a little mirror at an angle of 45 degrees. The light rays which penetrated into the tube were reflected by this mirror upon the lateral window of the tube and the operator was enabled in this way to make an examination of the urethral walls.

Urethroscopic tubes have been modified since by numerous authors.

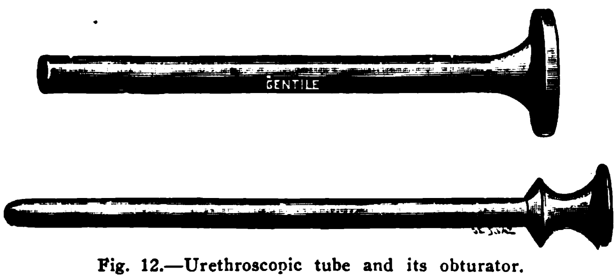

Fig. 12.—Urethroscopic tube and its obturator.

Posner has recommended glass tubes varnished black inside, to prevent the reflected light in the tube from dazzling the observer. Tubes of gum and hard rubber have also been recommended.

With the object of enlarging the field of vision, Auspitz devised a urethroscopic tube with two movable valves opening into the urethra, so as to obtain the maximum view of the urethral mucosa without at

the same time dilating the urinary meatus. This idea has also been utilized by Oberlaender and by Horteloup (Fig. 14). By separating the arms of the tube by means of the screw *D*, the field of examination in the urethra is increased.

Finally, Janet suggested a double endoscopic tube. It is composed of two tubes, one sliding into the other. The inner tube has a window

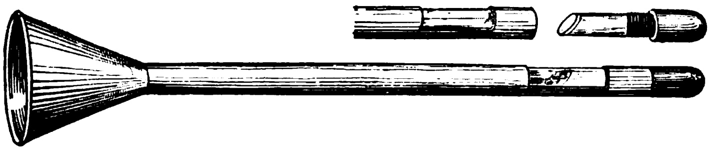

Fig. 13.—Grünfeld's tube with window and mirror.

which permits inspection of the bladder neck. The outer is an ordinary urethroscopic tube open at both extremities. When the inner tube is removed, the outer enables the observer to examine the urethra in the usual manner.

Quite recently tubes have been constructed according to the suggestions of Kollmann and Wiehe (Fig. 15). Their object is to permit

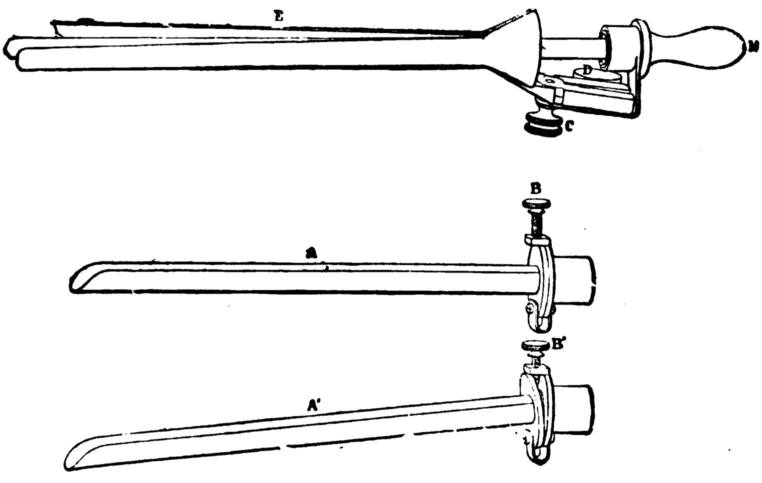

Fig. 14.—Horteloup's bivalve speculum. By removing the branches, by means of the screw *D*, the visual field at the bottom of the urethra is increased.

the dilatation of the distal portion of the tube by means of a screw situated at its outer extremity, in a manner similar to the dilatation of the horn of a bagpipe. But this method, while very ingenious, really gives but a very slight enlargement of the visual field and the slight advantages which are thus secured hardly compensate for the inconveniences of the method which are due to its complexity.

Advantages and Disadvantages of Urethroscopes Having External Illumination.—The outstanding advantage of urethroscopes with external illumination is that manipulation or intervention in the interior of the tube is simplified. The cotton carrier and the instruments which are introduced into the tube are freely movable and do not interfere with the source of light. Besides, the field of vision is certainly somewhat greater than in the case of internally illuminated urethroscopes, in which the lamp occupies a certain amount of the lumen of the tube.

But these advantages are not without some very serious inconveniences. Principal among these is the fact that they do not provide a clear and distinct view. However intense the light may be, it is always too feeble just where it ought to be strongest; namely, at the bottom of the tube. Inasmuch as we approach the source of light as closely as possible when we desire to see an object well, there is a

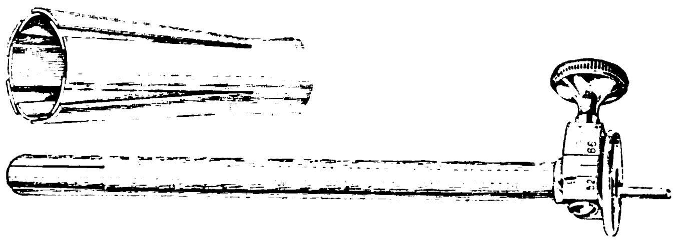

Fig. 15.—Kollmann-Wiehe tubes.

similar reason for placing the illumination as near as possible to the urethral mucosa. We may, therefore, conclude that internal illumination will always prove superior to external illumination.[1]

In order to convince myself of this fact, I have made a series of experimental comparisons. Holding a simple tube vertically, I first projected into it the rays of a very powerful electric light, situated outside the tube and obtained but a fairly good view at the bottom of the tube. On the other hand, when I substituted for the external illumination a very small lamp placed directly at the point of examination, I obtained a splendid illumination and a much more distinct view than previously. It was indeed natural to expect that this method would furnish a light superior to that obtained by external illumination. Bringing the light as closely as possible to the area to be examined is by far the most favorable condition for obtaining a satisfactory view. A beacon light, be it ever so powerful, if situated at some distance from the surface to be examined, will give less illumination than a simple electric light placed directly over it. For these reasons, I

think it is exercising good judgment to give preference to urethroscopes having internal illumination.

Again in the case of externally illuminated instruments, such, for example, as Clar's photophore, much experience and considerable effort are required to project the rays of light into the interior of the tube. Both the tube and the mirror being movable independently of one another, the operator is called upon to maintain a fixed and steady position, often tedious and difficult, in order to derive effective results.

When the light is attached to the proximal (outer) end of the tube, the lumen is obscured and a view is obtained only by the aid of a mirror perforated in its center. In some instances the apparatus is arranged with a system of reflection by a mirror and lenses which makes the handle of the instrument heavy and renders it uncomfortable for the patient and difficult for the surgeon to manipulate. Intra-urethral intervention is far more difficult and complicated, for it can be accomplished only with the aid of cumbersome and complex instruments with elbowed shafts. To conclude, it does not appear that urethroscopes with external illumination will ever be made that will be simple, practicable and easy to manipulate.

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[1]Luys: Bull. de la Soc. de l'Internat., Feb. 22, 1905, p. 23.

Urethroscopes With Internal Illumination

In 1879 Nitze first conceived the idea of introducing the source of illumination down to the bottom of the tube, near the surface to be examined.[1] This is undoubtedly the ideal method of examination, for as he puts it, "in order to light up a room, one must carry a lamp into it."[2] His instrument consisted of the ordinary urethroscopic tube (Fig. 16) in the wall of which were three minute canals or channels. In one of these channels was an electric wire which led down to the lamp placed at the extremity of the tube. The lamp consisted of an incandescent platinum wire. The two other canals permitted the constant circulation of a stream of water, which prevented the overheating of the instrument. This primitive instrument did not prove to be practical, however, for the lamp, being too large, diminished the visual field to a corresponding degree.

Subsequently Leiter and particularly Oberlaender perfected this interesting method, and the latter devised a urethroscope which immediately showed marked superiority to all that had been employed previously. Oberlaender's urethroscope (Fig. 17) affords a very dis-

tinct view. The platinum wire which carries the light projects but slightly into the lumen of the tube and admits of a very clear view of a rather extensive portion of the urethral mucosa. This instrument has two great disadvantages, however; first, it requires the circulation of water to cool the lamp, thus necessitating an expensive and complicated outfit, and second, it compels the operator to withdraw the lamp

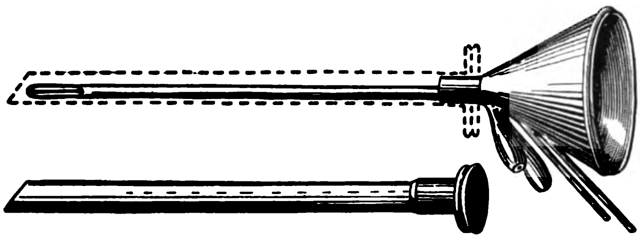

Fig. 16.—Nitze's urethroscope.

from the tube every time he desires to make a local application to the urethral mucosa.

Valentine, of New York, fortunately corrected these faults by replacing the platinum incandescent wire with a very small electric bulb mounted on a thin metallic shaft which makes it possible to bring the light down to the bottom of the tube. This lamp (Fig. 18) is supported by a handle which is provided with a current interrupter (Fig. 19).

Apart from this modification, which, by the way, was of great

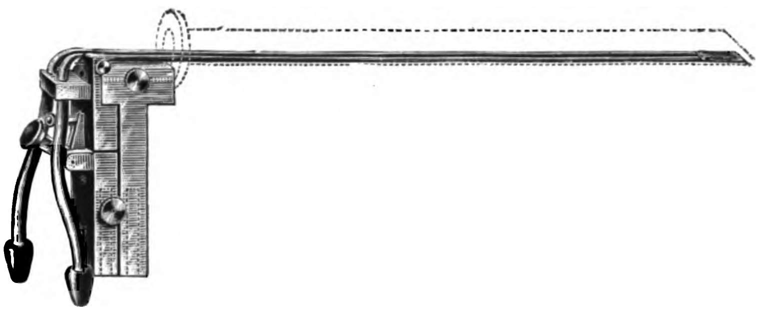

Fig. 17.—Oberlaender's urethroscope.

importance in its time, the other parts of Valentine's urethroscope do not vary materially from that of Oberlaender. The tube and its obturator are identical with the Oberlaender-Kollmann (Fig. 20).[3] Kollmann, of Leipzig, has adapted this instrument, somewhat modified, for taking photographs of the urethra.[4] His photographic urethroscope is shown in Fig. 22.

For the purpose of increasing the visual field, Kollmann with the

collaboration of Wiehe, devised a movable optical apparatus which was introduced into the urethroscopic tube and attached to the shank of the lamp (Fig. 23).

Wasserthal, of Carlsbad, also modified the Valentine urethroscope

Fig. 18.—Valentine's urethroscopic lamp.

by adopting Antal's old idea. He constructed an air urethroscope designed for examination of the urethral mucosa under distention with compressed air, blown into the urethra (Fig. 24). Although this method affords an excellent profile examination of a large portion of the urethral mucosa, it has the disadvantage of not permitting a front view of the mucosa, an indispensable need in many instances. Gordon, of Vancouver,[5] has constructed a urethroscope similar to the one just described (Fig. 25).

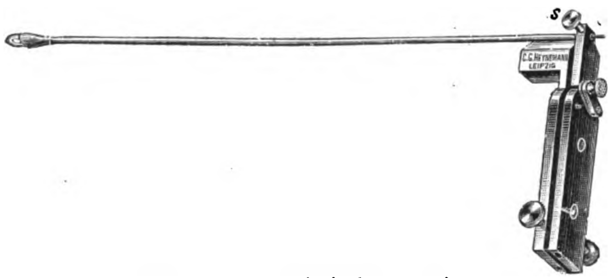

Fig. 19.—Valentine's lamp carrier.

Valentine's instrument has undergone still another modification on the part of R. Kaufmann (Fig. 26). This author attached a telescope in front of the urethroscope thus producing an enlargement of the urethral view. But this apparatus, rather heavy and cumbersome, presents certain difficulties in the performance of operative maneuvers within the tube.

Demonchy's recent urethroscope has much in common with that

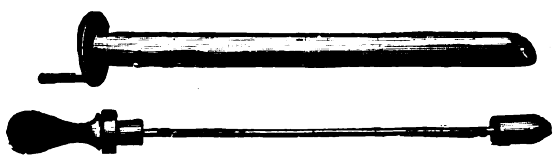

Fig. 20.—Oberlaender-Kollmann urethroscopic tube.

of Kaufmann, differing from it, however, in the character of the handle. This handle, twelve centimeters in length, presents a plano-convex achromatic lens which gives a reversed picture. This is examined and magnified through another lens, the eyepiece. This instru-

ment has decided disadvantages, the principal being its lack of simplicity (the first essential of a good instrument); in addition the handle is difficult to control because of its large size. A second disadvantage

Fig. 21.—Valentine's urethroscopic outfit.

is found in the reversed picture, which does not give a view of the objects as they really are. All in all, this instrument is too complicated and cumbersome to be practicable.

From a practicable point of view, Valentine's instrument actually had several distinct disadvantages. Whenever a lamp broke or burned out, it took great care and much time to replace it; the lamp itself was

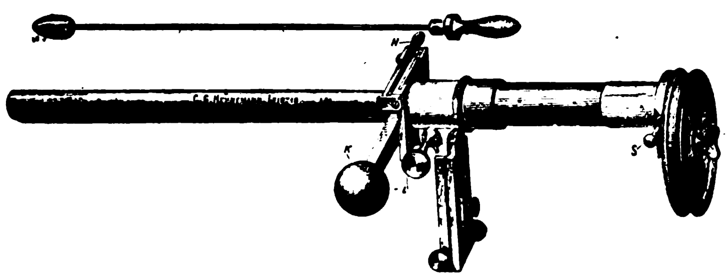

Fig. 22.—Kollmann's photographic urethroscope.

short-lived, for if a drop of fluid got inside of its little metallic sheath, a short circuit was established, which burned it out; though the urethral lesions could be seen clearly, they might, nevertheless, occasionally remain undiscovered because the field was not magnified; lastly, the

little lamp and its holder made an appreciable projection into the lumen of the tube, thereby diminishing the visual field considerably.

In the hope of remedying these disadvantages, I have devised a number of important modifications of this instrument, the first of which was presented before the Surgical Society on December 24,

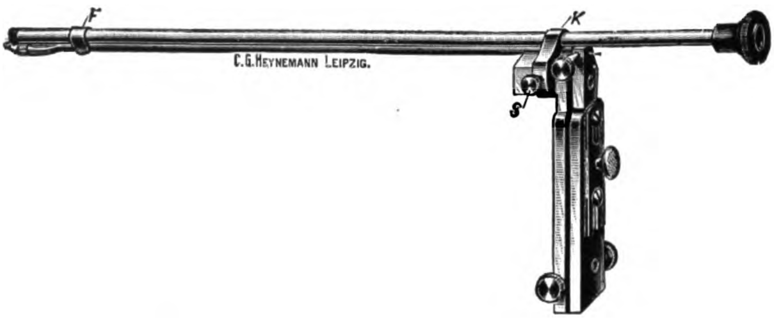

Fig. 23.—Handle of Kollmann-Wiehe's urethroscope, provided with an optic apparatus.

1902, and later shown to the Academy of Medicine by my teacher, Le Dentu.[6]

1. I added to the urethroscope an adjustable lens, the focus of which corresponded with the length of the urethroscopic tube. The urethral lesions are thus magnified and none of them can possibly be

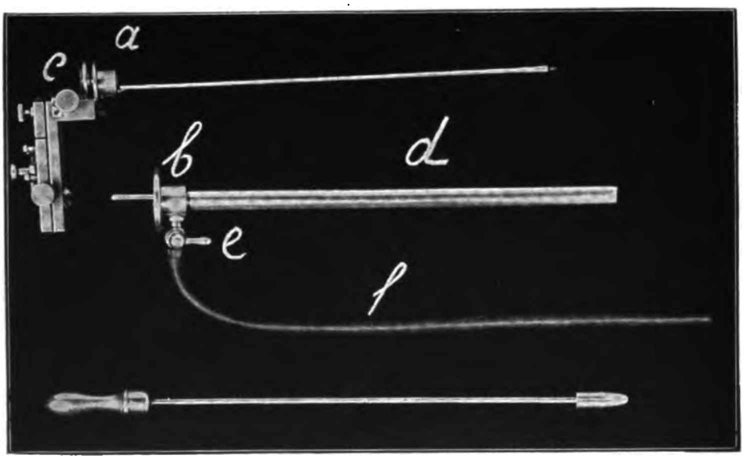

Fig. 24.—Wasserthal's aerourethroscope.

overlooked. In order to observe the picture clearly, the presence of the magnifying glass is really very useful, and makes possible the study of interesting details which can readily escape the unaided eye. The urethroscope being an instrument designed especially to afford an exact diagnosis, the great value of magnification in outlining the

details and character of the urethral mucosa can be readily comprehended. It is therefore strange, to say the least, that certain ingenuous observers are unwilling to avail themselves of this important improvement, on the ground that they are obliged to readjust the lens in making local applications. Moreover, a very recent improvement

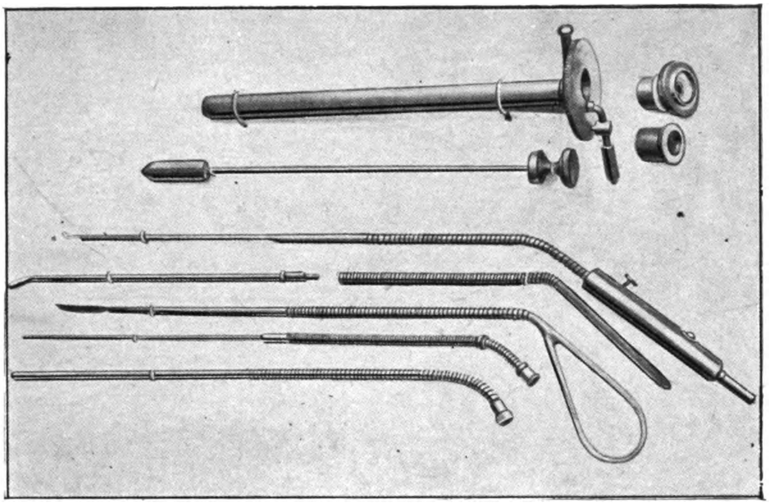

Fig. 25.—Gordon's endoscope.

makes it possible for endourethral activities to be undertaken without adjusting the magnifying lens (see page 45).

This lens is interchangeable easily, so that whether the operator is myopic, normal, or presbyopic, he can have a special lens made easily

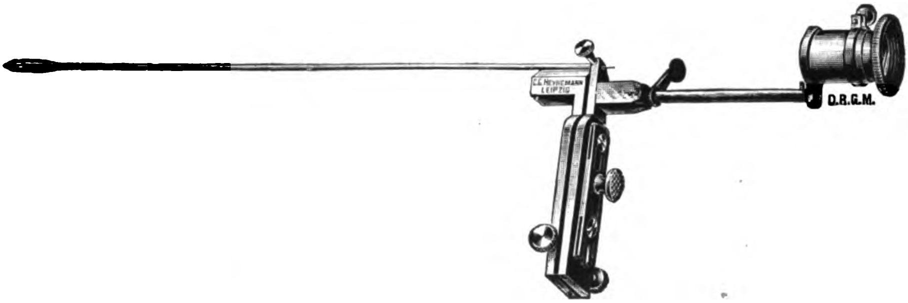

Fig. 26.—Handle and telescope of Kaufmann's urethrescope.

which will give him a most perfect and distinct picture with the least effort.

2. The shank of the lamp carrier has been perfected; the space between the metallic shaft and the bulb has been filled in so that not a drop of fluid can enter and thus bring about a short circuit.

3. Changing the lamp is a very simple procedure, and can be done in a few seconds.

4. The lamps are mounted on slender rods of varying lengths, corresponding to long or short urethroscopic tubes, for examination of the anterior or posterior portions of the urethra respectively.

5. Finally, at my suggestion, the urethroscopic tubes have been hollowed out throughout their entire length with a little furrow, in which the lamp and its carrier are retained without interfering with the lumen of the tube.

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Description of Luys' Urethroscope

My urethroscope consists of two distinct parts: 1. The urethroscopic tubes and their obturators; 2. The handle and the light carrier.

Urethroscopic Tubes.—The tubes present for examination a body or shaft and two extremities. The body is composed of a tube not perfectly cylindrical in shape; that is, on one of its walls throughout

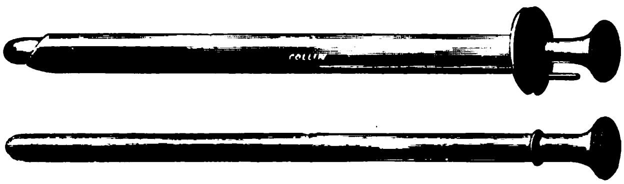

Fig. 27.—Luys' long cystoscopic tube and its obturator. Inferiorly can be seen the longitudinal depression for the lamp and its shaft.

its entire length, a small groove or channel is found, which lodges the lamp and its carrier. In this way, instead of protruding into the lumen of the tube, the lamp and its carrier are hidden in the thickness of the wall and become a part of it; this increases by a corresponding amount the inner diameter of the tube and accordingly enlarges the visual field.

One of the extremities of the tube is designed to articulate with

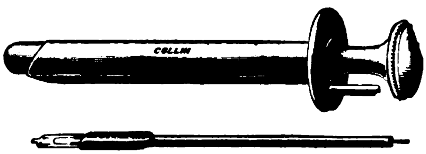

Fig. 28.—Luys' short urethroscopic tube and its lamp.

the handle; to it is attached a large circular flat collar which bears a small metallic projection upon which the handle is affixed and tightened with a screw, when in use. A slight notch in the margin of the collar makes the handle firm and immovable. The other extremity is blunt. in contrast with the German tubes, in order to protect the urethral mucosa from possible damage.

Length of the Tubes.—The tubes I usually employ are of varied lengths, depending on the particular part of the urethra to be examined. The long tubes are 14 cm. long (Fig. 27). They are designed especially for examination of the posterior urethra. The short tubes (Fig. 28)

designed for the penile (anterior) urethra, are 7 cm. long. The medium-sized tubes are most frequently used; they measure 13 cm. in length.

Caliber of the Tubes.—To determine the most desirable caliber for the urethroscopic tube, Oberlaender and Kollmann examined three hundred patients, and out of this number they found that only two or three per cent had a meatus too small to admit a No. 23 Charrière, while in the great majority of cases (69 to 70 per cent) No. 27 and even No. 29 was admitted easily. They concluded that No. 23 must be used in 10 per cent of patients, and No. 25 in 25 per cent of patients. These investigations show, therefore, that the greatest number of patients have a meatus sufficiently large to admit at least No. 25. My personal observations are in absolute accord with these figures, so that in most cases I use a No. 26 tube.

In a general way, it may be said there is a decided advantage in using the largest possible tube, for the surface to be examined is thereby stretched and the folds of the mucosa disappear, so that minute lesions which would otherwise be obscured, are brought to view.

Material Used.—The tubes which I use are of metal, nickel-plated. Tubes of this kind are most easily cleaned, sterilized, and handled. Some operators prefer glass tubes, because they are nonconductors. A short circuit may sometimes occur when the metallic lamp carrier is introduced into a metallic tube, and the current turned on, but this can easily be avoided if certain precautions are taken. On the other hand, however, the fragile nature of glass tubes gives ground for fear that they might break while in the canal and produce serious injury. Grünfeld, among others, has recommended hard rubber tubes; but these tubes do not seem to have any advantage over the metal ones.

The obturators, as opposed to those of German make, are full-plated metallic rods. Their manipulation and withdrawal from the tube offer no difficulties of any kind. In my first models a small groove ran along the entire length of the obturator, for the passage of a current of air on withdrawal of the obturator after the tube had been introduced. This prevented the urethral mucosa from being aspirated into the bottom of the tube. There was neither trauma nor pain. This plan did not prove practicable, however, and I have since had the wall of the tube grooved along its entire length, thus securing all the benefits, without the disadvantages, of the groove on the obturator.

The Handle.—The handle consists of a metallic body long enough to offer a good purchase for the hand, and provided with an interrupter designed to make and break the electric current. The electric wires which carry the current are attached to its lower extremity. At the

upper end is a magnifying lens, easily movable from side to side in a transverse direction. This lens, engaged in a small metallic circular holder, is easily demountable, so that it can be changed readily to correspond with the size of tube employed. Each size of tube has its corresponding lens, the focus of which is exactly suited to the length of the tube.

Some observers have felt obliged to criticize my employment of this lens, which they declare interferes with a clear urethral view. "The field is seen very well with the magnifying glass," they say, "but if we wish to treat the mucosa and we move the lens, we can no longer see the details so well as before, and the local treatment becomes more difficult of application." To overcome this objection I have very small

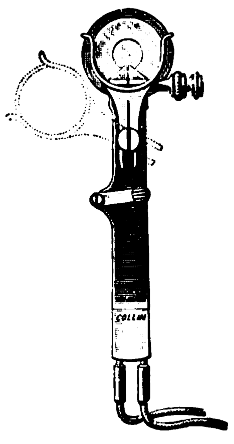

Fig. 29.—Handle of Luys' urethroscope, showing the magnifying lens and the wires (front view).

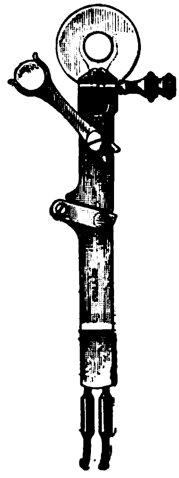

Fig. 30.—Improved model of the handle of Luys' urethroscope, in which the lens, much reduced in size, need not be turned aside during endourethral manipulations.

lenses made which are maintained in place by a metallic frame attached to a slender holder (Figs. 29 and 30). Instruments can be introduced into the urethroscope alongside the margin of this lens. The latter, having the same diameter as that of the lumen of the tube, may remain stationary, not only for observation of the urethral mucosa, but likewise in making local applications to the mucosa. The lens, because of its small size, does not offer the slightest interference with intraurethral manipulations and applications.

With this simple optical system, it is no longer necessary to displace the magnifying lens in the case of endourethral intervention, and it is at the same time possible to preserve the magnification perfectly throughout the examination.

Finally, the small electric lamp is attached to the tube, mounted on a carrier of varying length, in accord with the length of the tube. The light carriers are measured exactly so that the electric bulb approximates the lower extremity of the tube, without, however, coming into contact with the mucosa. The ease and rapidity with which a lamp can be changed or replaced are very striking indeed, only a few moments being sufficient for the purpose.

Urethroscopic tubes are sterilized by boiling; the lamps are sterilized like the cystoscopic lamps; i. e., in formalin [or alcohol—EDITOR].

This is the instrument I have always operated with and with complete satisfaction. It answers any criticism that may be made regarding it. The danger of a burn is absolutely nil, for the cold lamps em-

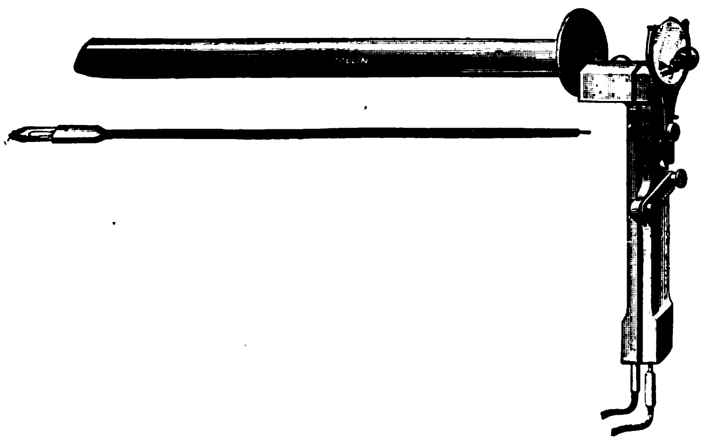

Fig. 31.—Profile view of Luys' urethroscope (complete).

ployed give forth no appreciable heat while they are new. In all the examinations I have made, no patient has ever complained of any disagreeable sensation of heat. From this point of view it is well to change the lamp frequently and to have a stock always on hand, for they are quickly used up, and whereas when new, they are absolutely cold, so that they may be held between the fingers, while lighted, without any perception of heat, it is nevertheless true that after they have been used for some time they become hot and have to be replaced. In buying these lamps, only those having the smallest caliber and which are absolutely cold should be selected. On the other hand, endourethral manipulations are quite possible with the lamp *in situ*. All manipulations are done under the eye of the operator. Lastly, illumination of the urethral mucosa is perfect and far superior to that furnished by urethroscopes with external illumination.

Special Urethroscopes for the Posterior Urethra

Because of the protrusion of the verumontanum into the urethra, the examination of the posterior portion of the canal presents special difficulties. The tip of a straight tube strikes against the anterior prominence of the verumontanum (Fig. 32), so that certain precautions are required to prevent its interference with the introduction of the instrument. This accounts for the many modifications adopted by various authors; namely, elbowed instruments and distention of the posterior urethra.

Goldschmidt conceived the idea of using water for the purpose of

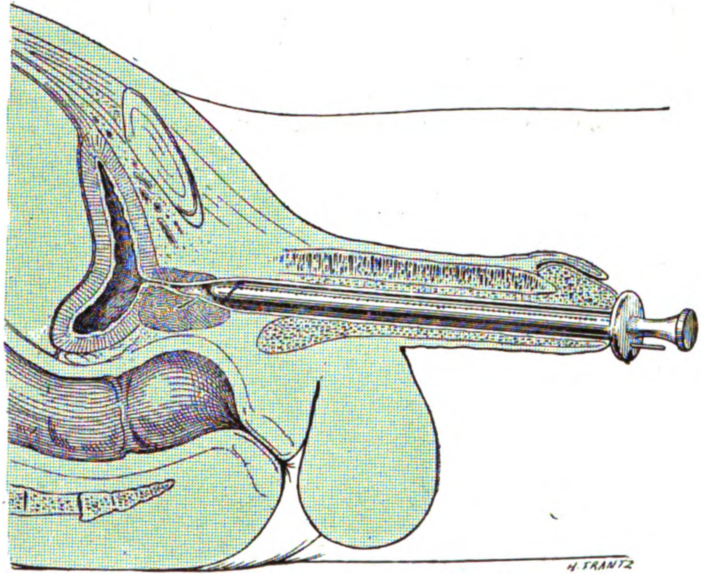

Fig. 32.—Illustrating how the prominence of the verumontanum arrests and obstructs the extremity of the urethroscopic tube.

dilatation; Wossidlo, following Antal, employed air. For my own part, after having tried endless improvements designed to secure a better knowledge of the posterior urethra, I have given up these complicated instruments entirely and have given preference to my simple tube. Handled cautiously, this tube has always in its favor its enviable simplicity and the extreme facility with which it is managed.

Goldschmidt's Irrigation Urethroscope for the Posterior Urethra.—This instrument (Fig. 35) is both interesting and useful in the examination of the deep urethra. It resembles a model previously adopted by Le Für (Figs. 33 and 34). In 1903 Le Für presented a urethroscope which was characterized by the fact that the lamp was attached to the end of the urethroscopic tube as in the cystoscope.

While this arrangement had the advantage of providing an unobstructed lumen in the tube, it had the drawback that the eye of the operator was dazzled by receiving the light rays directly against it, and as a result, the details of the mucosa could not be distinguished clearly.[1]

This idea was taken up by Goldschmidt, of Berlin,[2] who, in 1906,

Fig. 33.—Le Für's urethroscopic lamp.

devised an interesting urethroscope, with which excellent results can be obtained in special cases. He dilated the walls of the urethra with water under hydrostatic pressure and thus examined the urethral mucosa. His instrument consists of two parts, one for the anterior urethra, the other for the posterior; each of these contains an optical sys-

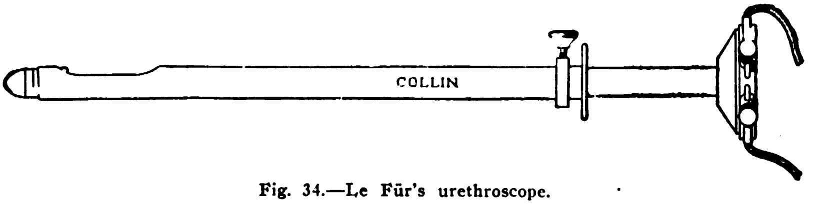

Fig. 34.—Le Für's urethroscope.

tem which brings a rather large portion of the urethra under observation, by enlarging the field of vision.

Technic.—After emptying the bladder naturally, the patient is put in the position for cystoscopy; the head low, body horizontal, the buttocks at the edge of the table, the thighs flexed, and the heels sup-

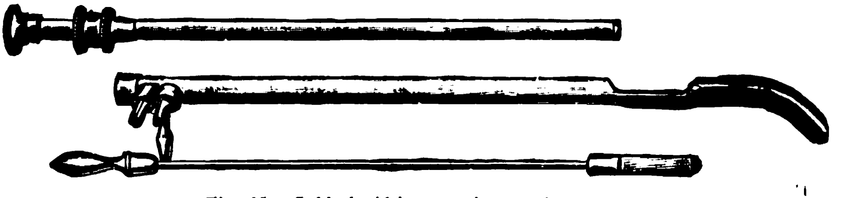

Fig. 35.—Goldschmidt's posterior urethroscope.

ported by stirrups or footrests. The instrument and its obturator having been sterilized and lubricated with glycerin, it is introduced as far as the posterior urethra, which it enters readily because of its elbowed tip. The electric cable is connected with the rheostat, and the stopcock at the upper end of the tube is connected with an irrigating jar containing warm water [preferably a mild antiseptic

solution—Editor] elevated about two meters above the level of the table. The obturator is then withdrawn and the optical sheath or telescope is inserted and tightened in place. This being done, the stopcock is opened, the electric current turned on, and the posterior urethra is now examined by moving the instrument to and fro and rotating it, as required. The water runs naturally into the bladder; when the latter becomes full, the patient feels a desire to urinate. The current is turned off, the stopcock closed, the telescope is withdrawn and the water in the bladder is permitted to escape into a drain attached to the table. Goldschmidt has also devised an anterior urethroscope based on the same principle (Fig. 36).

Advantages.—This instrument has notable advantages. A complete examination of the posterior urethra is made possible without interference by the presence of blood, the latter being constantly carried off by the stream of water into the bladder. Besides, the walls of the posterior urethra are well separated from one another, thus giving a clear view and distinct landmarks. Lastly the pictures are greatly magnified and the smallest details are discernible; even the smallest polypi float in the water and are easily recognized.

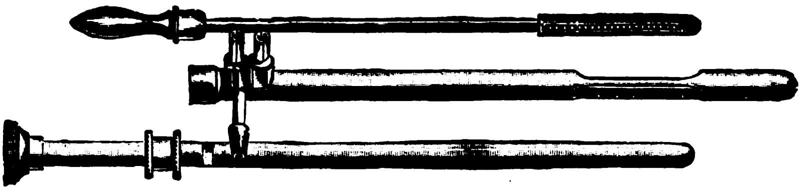

Fig. 36.—Goldschmidt's anterior urethroscope.

Disadvantages.—Unfortunately the disadvantages of this instrument are more numerous than the advantages. To begin with, the apparatus is complicated necessarily. The management of the optical system and the essential presence of the current of water make this instrument anything but a simple one. Again, the urethroscopic pictures are not seen as they really are; the mucosa is white, pale, and bloodless, for the water exerts pressure on it which produces a localized anemia. Moreover, it is impossible with this instrument to get a complete view of the entire posterior urethra at one time. Only one wall of the urethra can be seen at once, for an entire half of the lumen of the instrument is taken up by the lamp. The superior wall, above the verumontanum, can not be examined at all, and this is a serious defect. Finally, the endourethral interventions, such as local applications and cauterization, are rather impractical and difficult with this instrument.

Summary.—Though this instrument is excellent for examination

purposes, its employment seems to be limited to those comparatively few cases in which it is desired to acquire exact pathologic details of the posterior urethra. Alfred Rothschild[3] has devised some interesting modifications of Goldschmidt's instrument.

Buerger's Cystourethroscope.—Buerger,[4] of New York, has improved upon Goldschmidt's instrument by devising an apparatus which is based on the same principles as those of Nitze's first cystoscope (Fig. 37). The defects which he finds in the Goldschmidt instrument are the limited field of vision, distortion of the pictures, and difficulty of manipulation because of the traumatism which it causes.

Buerger's instrument does not possess these disadvantages; the pictures are magnified by virtue of a prism situated on the upper wall of the instrument.

TECHNIC.—The tube armed with its obturator is inserted into the bladder; the latter is emptied through the tube, and the telescope is inserted on withdrawal of the obturator. The stream of water is intro-

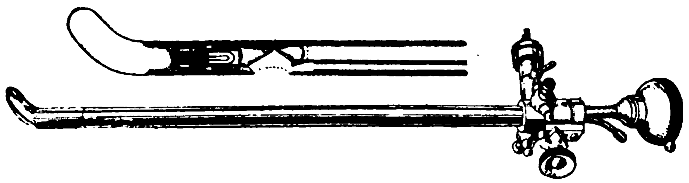

Fig. 37.—Buerger's cystourethroscope.

duced by a lateral stopcock connected with an irrigator filled with warm antiseptic solution. The electric current is now turned on. The trigone is first examined, next the posterior urethra, the fluid being injected only from time to time. Not more than 50 to 150 c.c. of fluid may be necessary. The instrument can be turned in every direction because of the smallness of its window.

This is essentially an examination instrument and is not practicable for endourethral work. This cardinal fault necessarily restricts its usefulness.

Wossidlo's Posterior Urethroscope.—In 1908 Wossidlo[5] devised an instrument (Fig. 38) for posterior urethroscopy in which air was used for dilatation of the canal, but in a more recent model he also employs water for this purpose. This instrument undoubtedly presents a clear and distinct detailed view of the urethral mucosa, but it also has important disadvantages. The principal one is that the instrument does not give a true picture. The object under examination is deformed by the optical system with its great magnification, to such an extent that

the real condition of the mucosa can not be determined accurately. There is another great drawback, in that it is impossible to operate on the lesions that the instrument reveals, because the optical apparatus interferes with the introduction and manipulation of instruments within the urethroscopic tube, so that when therapeutic intervention is attempted, the telescope must be removed; the mucosa previously magnified is now only dimly visible by the unaided eye.

Dommer, of Dresden, attempted to remedy these disadvantages. He devised an optical apparatus which permits the use of an electrode, a curette, and a bistoury, while the apparatus is in position. The entire outfit is introduced in a Wossidlo urethroscopic tube; naturally

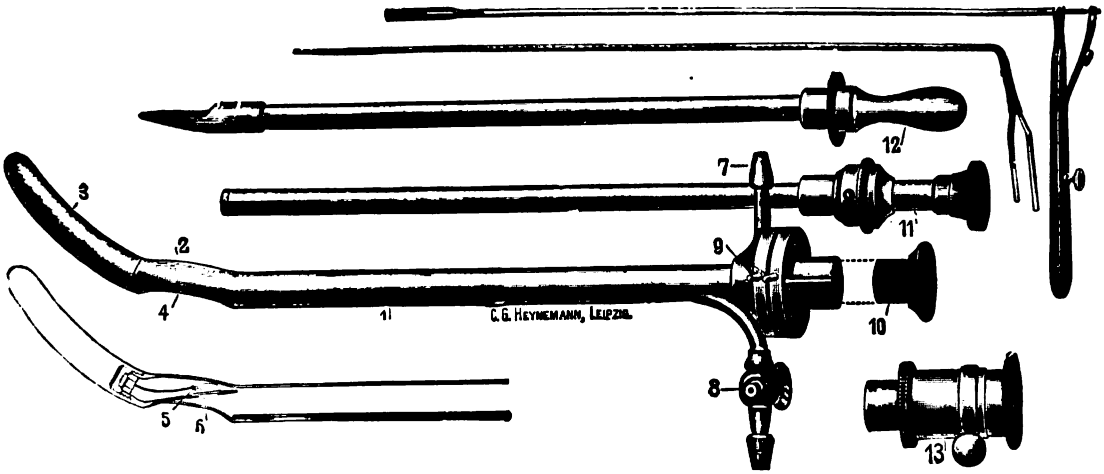

Fig. 38.—Wossidlo's posterior urethroscope.

the diameter of the tube is increased by several numbers, thus rendering its routine employment rather difficult.

Summary.—Wossidlo's apparatus, like that of Goldschmidt and Demonchy, is complicated, the principal fault being that the optical apparatus is heavy and difficult to manipulate.

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PLATE I

FIG. 1.—*Normal appearance of the prostatic fossette* (postmontane space) situated between the bladder neck and the verumontanum. Below, the apex of the posterior wall of the verumontanum can be seen; above, can be seen the orifice of the bladder neck from which longitudinal folds descend in fan shape.

FIG. 2.—*Normal appearance, anterior view of the verumontanum,* in which the prostatic utricle is distinctly seen. The upper part of the urethral mucosa is finely corrugated and constitutes a valuable landmark in determining the shape and size of the verumontanum. This is the most common view observed.

FIG. 3.—*Another normal aspect of the verumontanum,* in which the prostatic utricle is *not* visible. Above are seen the corrugations of the urethral roof above the verumontanum; below, the anterior frenum of the verumontanum is recognized.

FIG. 4.—*Normal appearance, anterior aspect of the verumontanum,* when the urethroscopic tube has been brought forward anterior to the preceding figure. The protrusion of the verumontanum has diminished in height and width; in front of the verumontanum, its frenum is clearly seen; above, on the roof, the corrugations have increased the thickness of the mucosa appreciably.

FIG. 5.—*Appearance of a very considerably hypertrophied (masturbator's) verumontanum.* The organ here takes on the appearance of the uterine neck.

FIG. 6.—*Normal appearance, anterior surface of the verumontanum.* The prostatic utricle is not visible, but on the lateral walls of the verumontanum, two orifices are seen corresponding to the ejaculatory ducts (resembling a diver's helmet).

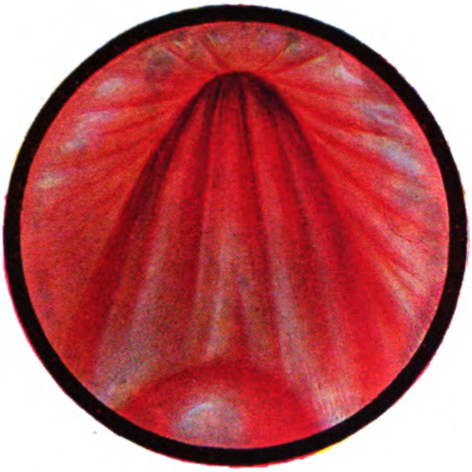

Fig. 1.

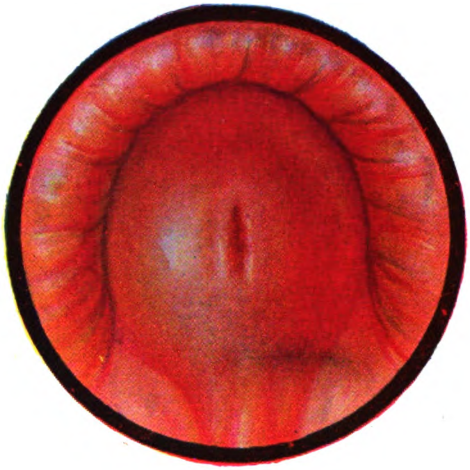

Fig. 2.

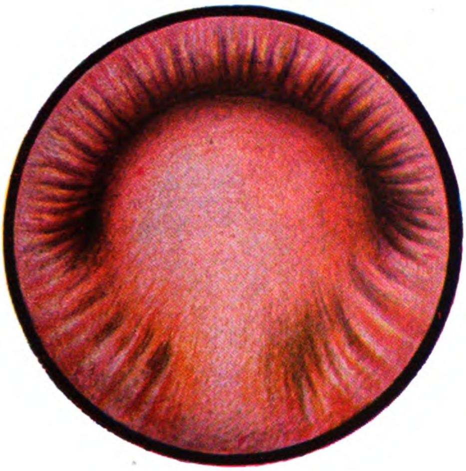

Fig. 3.

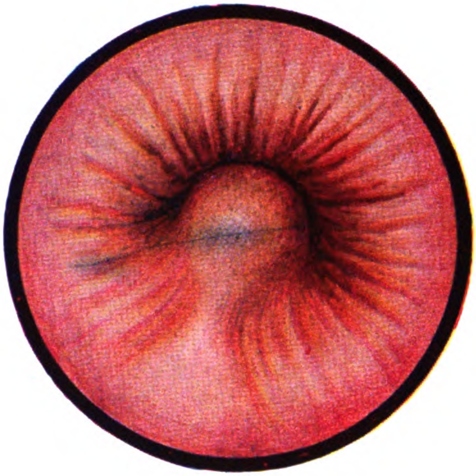

Fig. 4.

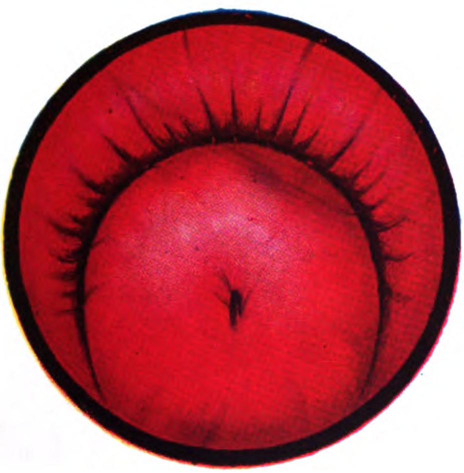

Fig. 5.

Fig. 6.

PLATE I

Personal Experience with the Posterior Urethroscope.—The excellent results obtained with my direct vision cystoscope and rectoscope induced me to adopt the same principles of examination for the posterior urethra. I, therefore, undertook a series of experiments and made attempts to improve upon the instruments devised for this purpose. I constructed a tube similar to my direct vision cystoscope; that is, provided on its lower inner surface with a fine canal which was open at the end of the tube and connected with two stopcocks on the outside. Through this tiny canal it was possible to aspirate fluids or inject air by means of a rubber bulb. Illumination was provided by a small electric lamp mounted on a long stem or carrier. A small sheet of glass mounted on a metallic brace assured closure of the small orifice by adapting itself by pressure to the external orifice of the tube. This glass window was to be used solely in connection with insufflation of the posterior urethra.

ADVANTAGES.—When air was forced into the deep urethra under pressure, perfect vision was obtained; it was like a cloud being dissipated, a disappearing shadow, leaving a perfect illuminated view of the verumontanum. Moreover, swabbing with cotton was rarely needed, for the presence of the air was quite sufficient to dry up the slight oozing of blood and even the pathologic secretions. Inasmuch as the walls of the urethra were widely separated from one another, a complete view of the entire posterior urethra was thus obtained.

Another great advantage over the water-dilated instruments lay in the fact that the operator was not annoyed by the presence of air bubbles which interfere with distinct vision by filtering through the water. The color of the mucosa was hardly altered; it was not blanched as is the case with the water urethroscopes and its appearance was practically normal.

DISADVANTAGES.—The air which served to dilate the posterior urethra, passing directly into the bladder, constituted the principal disadvantage. The bladder soon became full, resulting in a characteristic desire to void the urine. When the prostate was small, nothing could be easier than to pass the tube gently into the bladder, open the tube, and evacuate the viscus in this way. But when the prostate was somewhat enlarged, it became a difficult matter to empty the bladder in this manner. This is certainly a disadvantage; the prostate formed a valve, so that the air entered readily but could not escape.

To obviate this drawback, I modified my first apparatus by curving its vesical extremity so as to permit its passing more easily into the bladder; I also placed a small opening at the end of the curve which permitted the air, under pressure in the bladder, to be evacu-

ated easily through the stopcocks on the outside of the tube. The posterior urethra was quite easily examined with this instrument. Frankly speaking, however, there are certain cases in which special methods of exploration are required, whichever instrument may be employed.

In the vast majority of instances, my simple urethroscopic tube is quite sufficient to make a complete examination of the posterior urethra, provided it is employed only after a thorough dilatation of the urethra with Béniqué sounds. The view thus obtained is perfect and we derive all the advantages of the special instruments without enduring their disadvantages. Finally, when in certain very special cases it is necessary to examine the region of the bladder neck and especially its urethral sides, my direct vision cystoscope, male model, is preferable to any other instrument (see page 225).

I venture to express the hope that the facility of management, precision of view and certainty of diagnosis which my urethroscope affords, will induce many physicians to return to urethroscopy, for many of the most zealous have had to abandon this valuable method of investigation after their first efforts, because of the difficulties in manipulating the instruments previously employed. If urethroscopy has been employed but little in France up to the present, the particular reason must be found in this fact that the instruments put at the disposal of physicians have really been very clumsy or else very complicated. I still think, after twelve years of experience, that my instrument deserves preference over other existing models, both for examination and therapy, because it possesses the cardinal features which we have a right to demand of any instrument; namely, it is simple and practicable.

HISTORY OF CYSTOSCOPY

The first attempts to examine the vesical mucosa through the natural passages were made, as we have seen, in the beginning of the nineteenth century. At first all the investigators, following the lead of Désormeaux, sought to project light rays into the interior of a hollow tube inserted into the bladder. But soon afterwards, different and more complicated procedures made their appearance in rapid succession.

Cruise, of Dublin,[1] in 1865, substituted an elbowed tube for the straight one. This tube had an obtuse angle and was provided with a mirror at its angle. The instrument consisted of two tubes, one of which, a straight one, slid into the interior of the other. The inner straight tube had a little glass screen at its vesical end, which pre-

vented the fluid in the bladder from obstructing the field of vision. The inner tube being movable, the bladder could be emptied readily when the fluid interfered with distinct vision.

In an earlier model, Cruise had a glass window at the vesical end of his tube; but when the light was reflected strongly upon the mirror, it dazzled the operator and interfered with his view of the bladder. In a second model, he closed the terminal extremity of his tube completely and placed the glass window almost at right angles with the mirror. In this way the light and visual rays were both reflected at 45 degrees and he thus obtained a reflected picture of the bladder, and even the bladder neck could be examined in this way.

The principle adopted by Bruck,[2] of Berlin, in 1867, was quite different. Bruck's diaphanoscope aimed to illuminate the bladder indirectly. It was made of two distinct parts; the first consisted of a powerful light emanating from an incandescent platinum wire, water-cooled. It had to be introduced into the rectum and was designed to illuminate the posterior wall of the bladder. The second part of the apparatus was a simple hollow metallic tube which was introduced into the urethra up to the bladder and permitted inspection of the vesical mucosa. Unfortunately this method did not furnish sufficient illumination of the bladder wall, and a clear picture was therefore impossible. It was soon given up and discarded.

Matters stood thus when the lamented Professor Nitze, in 1876, began his study of the subject; and we must here acknowledge that this inventor rightfully deserves first place in the history of cystoscopy because of his epoch-making work on this subject.

The new idea which he contributed and which differed radically from those of his predecessors, was that instead of employing external illumination, as they had done, he brought the light into the bladder itself; in his own words,[3] "in order to light up a room, it is necessary to bring the lamp along with you."

However, in view of the narrow canal leading into the bladder, it became necessary to develop a method which would permit magnification of the visual field, before this idea could be made really practicable. Nitze himself tells the circumstances in which this problem was solved. One day, in the hospital at Dresden, while examining the objective of a microscope to see whether it was clear, he looked through the lens at a neighboring church. He saw only a streak of light. Immediately the idea occurred to him that he could easily obtain an enlargement of the visual field with a system of lenses. His researches soon led to a system made up of four lenses combined with a prism.

As a source of light, Nitze first made use of an incandescent platinum film with which he obtained a very good, clear light. This had the disadvantage, however, of requiring circulation of water in order to avoid burning the mucosa.[4] This primitive instrument was improved and made more practicable through the aid which Leiter, of Vienna, gave him in 1879; and the name Nitze-Leiter, has been given to this early model. This instrument was complicated, however, by the fact that the essential presence of water proved impracticable because of the difficulty of protecting the platinum wire loop.

Conditions remained thus until the discovery of the Edison lamp. Applied immediately to cystoscopy by Nitze, this modification brought a great improvement to the original instrument, and in 1887 Nitze constructed his final cystoscope which is the underlying basis of all modern instruments. In this way, prismatic cystoscopy had its birth.

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History of Direct Vision Cystoscopy

Coincident with the researches of Nitze and his followers, other investigations, of equal interest, were being conducted. At Vienna Grünfeld, in 1881, taking up the principle of Désormeaux's method, attempted to make a direct examination of the bladder in both sexes by means of a straight tube having external frontal illumination. But the conditions under which he made his examinations of the vesical cavity were so imperfect that he derived but slight advantage from them. He actually looked at the vesical mucosa through a stratum of urine which he did not know how to eliminate. Neither could he distinguish the ureteral orifices except in a very imperfect manner, at least in the male subject. Later on, he published reports of this method of cystoscopy in the treatment of bladder tumors in the male and female.[1]

However, considerable progress followed Grünfeld's efforts, and he was soon able to remove bladder tumors by the natural routes and even succeeded in catheterizing the ureters in the female. All of these

efforts, however, were merely stepping-stones in the direction of direct vision cystoscopy.

To Kelly,[2] of Baltimore, whose work goes back to 1893, belongs the honor of having emphasized the importance of this method and of having indicated its great possibilities. Kelly made use of simple

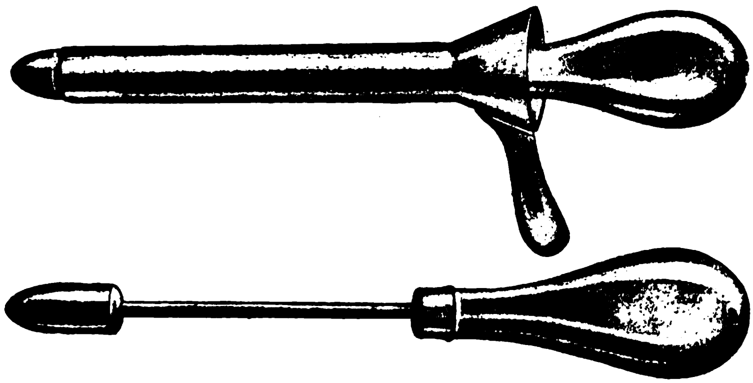

Fig. 39.—Kelly's endoscopic tube.

tubes provided with minute canals in their lumen, into which he sent luminous rays by means of an external illumination attached to the forehead of the examiner. To dilate the bladder in the female, he had recourse to atmospheric air. He had previously observed that

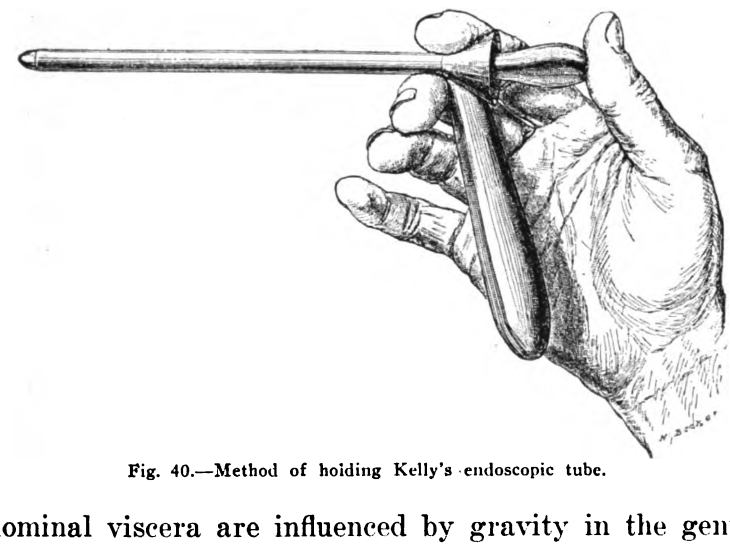

Fig. 40.—Method of hoiding Kelly's endoscopic tube.

the abdominal viscera are influenced by gravity in the genupectoral position, and are drawn downwards towards the diaphragm. This creates a tendency to a vacuum in the small pelvis which is made evident by a sudden and complete dilatation of the bladder. When a hollow tube was introduced into the urethra permitting the entrance

of air into the bladder, the latter became distended, to use his own expression, "like a balloon filled with air." Kelly employed this method in women with brilliant success.

In 1898 he published a report on catheterization of the ureters in the male with an open cystoscope.[3]

Pawlick, of Prague,[4] constructed a direct vision cystoscope, in 1898, which consisted of a speculum, provided with a handle (Figs. 41 and 42). He placed the patient in either the genupectoral or Trendelenburg position, which brought about the distention of the bladder by the entrance of air. With this instrument Pawlick examined the vesical cavity under the direct illumination of sunlight. When the

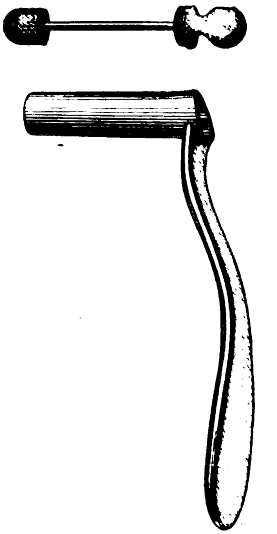

Fig. 41—Pawlick's endoscopic tube and obturator.

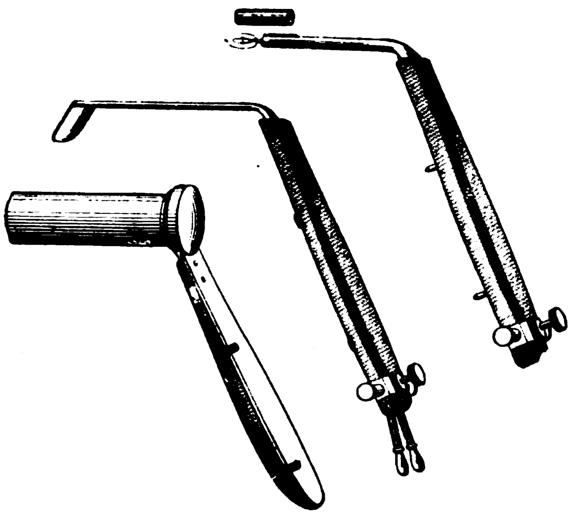

Fig. 42.—Pawlick's endoscope with its lamp and irrigating apparatus.

latter was not available, he employed electric illumination provided with an irrigation apparatus for cooling purposes.

Kelly's work stimulated further improvements which were soon applied practically in his instruments. One of the most interesting was the improvement of Garceau, of Boston,[5] who was the first to evacuate the bladder urine through an accessory canal included in the body of the urethroscopic tube adapted to the female. He constructed an instrument of this kind (Fig. 43) in 1895. He soldered an accessory tube of fine caliber into a cystoscopic tube so that when the handle of the latter was turned toward the right side of the patient the accessory tube was rotated to the inferior wall of the speculum. The urine was then aspirated by a Davidson syringe the bulb of which could be held by the hand which held the handle of the speculum

so that an assistant was not required. The simple idea of aspirating the urine as it was being secreted into the bladder, was sure to appeal to those who were using this instrument, and it soon had many imitators. In Europe it was our distinguished confrère, Hogge, of Liege, who devised a similar instrument for use only in the female, in 1897.[6]

In this instrument, the aspirating canal, also soldered to the cystoscopic tube, was joined on the outside to a rubber tube which terminated in a receptacle into which the urine drained automatically. Through the courtesy of its inventor, I exhibited this instrument at the Urological Congress of 1905.

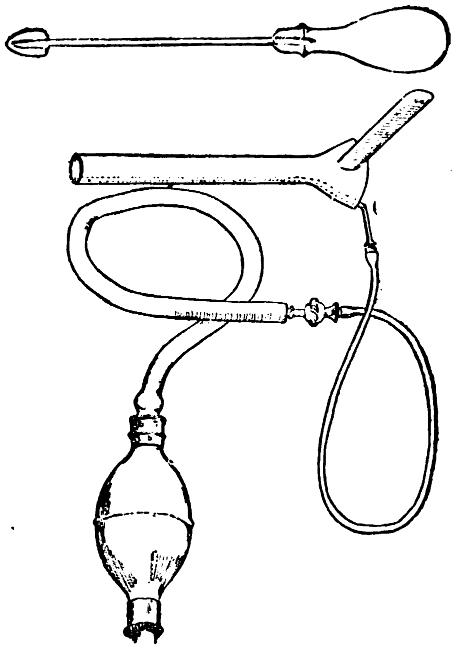

Fig. 43.—Garceau's endoscopic tube with its urine aspirator.

Very curious and quite groundless is the claim of De Keersmaecker, of Antwerp,[7] who claimed for himself priority of this improvement. As a matter of fact, his first paper appeared two years after Garceau's first paper[8] and more than six months later than Hogge's first article, while De Keersmaecker passed over both communications of his predecessor in silence.

Other interesting changes were made by way of perfecting Kelly's combination of instruments. Among these, attention may now be called to the interesting cystoscope devised by Bransford Lewis, of St. Louis, who described his instrument and the technic of its use before the Association of Genitourinary Surgeons. The Lewis cysto-

scope consists of a tube to which are attached a handle and a beak, the latter enclosing a small cold electric lamp. The instrument is introduced into the bladder with the aid of an obturator, which is then withdrawn. The proximal end of the tube is capped with an eyepiece composed of a single lens which corrects the inversion of the picture.

To dilate the bladder, Lewis[9] introduces warm air which is retained under pressure by a stopcock. Special channels are attached for the passage of ureteral catheters. Finally, to insure magnification of the image as well as of the visual field, a telescope is introduced which consists of a series of lenses and a prism.

Technic.—The patient lies with the pelvis raised somewhat. The cystoscope is introduced, the obturator withdrawn, the bladder emptied of urine and the glass cap applied over the orifice of the tube. Warm air is now introduced into the bladder to distend it and the

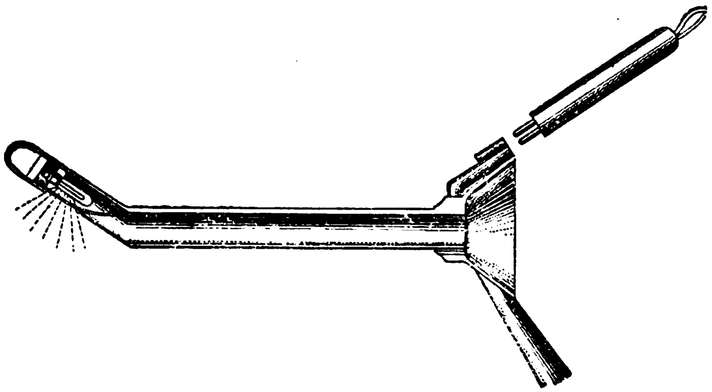

Fig. 44.—Cullen's cystoscope, without its optical part, the lamp reversed, emitting vertical rays downward.

electric current turned on. In this way the bladder may be examined, taking the precaution to aspirate the urine from the bladder from time to time with a syringe. Single or double catheterization of the ureters may thus be easily accomplished.

In 1903 Thomas Cullen[10] devised a bent cystoscopic tube containing no optical apparatus in its interior, but provided with an inverted lamp at its elbow which emitted vertical luminous rays from above downward (Fig. 44). This instrument was the basis of a more complicated and impracticable instrument presented nevertheless as original to the Surgical Society of Paris in May, 1905. It does not appear, however, that this apparatus can give satisfactory results. Indeed, every cystoscopic tube with an immovable elbow has a twofold defect. On the one hand, intravesical manipulation is difficult for the surgeon and painful to the patient, the elbow preventing easy

movement of the instrument within the bladder; on the other hand, with such an instrument, only the base of the bladder is visible, and the remainder of the viscus remains unexplored.

These two principal faults, which are of serious character, rendered any possible additional effort in this direction practically useless. In point of fact there is undoubtedly a great advantage in maintaining the straight form for the endoscopic tube. Its clean-cut edges permit the localization of a point such as the ureteral orifice and bringing it into the interior of the tube, just as the uterine cervix is brought within the lips of the vaginal speculum.

In France direct vision cystoscopy has been practiced but little, and up to the present but few authors have adopted it. One of the first works on the subject, is that of Janet[11] who, in 1891, devised a double endoscope, consisting of an internal tube provided with a window which fitted into the interior of an outer tube. With this apparatus Janet succeeded in examining the vesical mucosa. He inserted the instrument directly up to that portion of the bladder which was to be examined or treated, and on withdrawing the inner fenestrated tube, he thus obtained the bladder area upon which he could operate through the remaining external tube without the escape of the distending fluid.

In 1898 Clado[12] recommended the Trendelenburg position for distending the female bladder. Paul Delbet,[13] in 1902, devised an endoscope with blades that spread out like a fan within the bladder owing to a mechanism constructed on the principle of the iris diaphragm. This instrument could be used only in the female. Moreover the steel blades did not always approximate exactly at the end of the examination, and sometimes nipped the mucosa, doing more or less damage. In brief, this instrument, though ingenious, was a delicate affair, and thus failed to attain general popularity. In 1902 Clarence Webster,[14] of Chicago, and in 1903, Hartmann[15] also recommended the Trendelenburg position for the examination of the female bladder.

I began to study this question in 1902, after having completed my urethroscope,[16] when I immediately attempted to extend its field of usefulness from the urethra to the bladder. But it was not until October, 1904, that I presented before the Congress of Urology a direct vision cystoscope which gave me excellent results in the examination of the female bladder.[17] Applying later to the male what I first accomplished for the female, I constructed a direct vision cystoscope for the male which was presented to the Surgical Society on March 1, 1905.[18] My results and observations were announced in my work on "The Endoscopy of the Urethra and Bladder" which appeared in

April, 1905.[19] This work was presented before the Academy of Medicine by my former teacher, Le Dentu.[20] In June, 1905, I described my instrument and its technic in the *Presse médicale*[21] and in the *Annales de gynécologie et d'obstétrique.*[22]

The splendid results obtained through direct vision cystoscopy with my instrument were described in the *Annales génito-urinaires.*[23] In October, 1905, I reported in detail to the Congress of Urology the recent improvements in my instrument which produced an image and illumination far superior to those previously attained.[24] In November, 1905, I demonstrated[25] the valuable aid which my direct vision cystoscope gave in seeking foreign bodies in the bladder and I showed the ease with which such bodies even of large size could be removed from that organ.[26] As a crowning of my efforts in this direction, the Faculty of Medicine late in 1905 did me the honor to award the Barbier prize for my direct vision cystoscope. Since then I have continued to study the question and have profited by the lessons of experience to learn the great advantages which can be derived from this interesting method.

In 1906[27] the results attained with the direct vision cystoscope were pointed out and further elaborated.[28] In 1907 the simple treatment of bladder tumors was described.[29] In 1909 the great advantage of direct vision cystoscopy in searching for ureteral calculi was demonstrated,[30] and three years later the treatment of phosphatic bladder stones was described.[31] A resume of the advances in direct vision cystoscopy has been published recently.[32]

Since my first publications, many papers have been written and numerous modifications have been suggested for my instrument. Jean Ferron, of Bordeaux, thought that in certain circumstances it would be advisable to shorten the male cystoscopic tubes. Instead of 18 cm. which my cystoscope measures, Ferron employed tubes 15 cm. in length and at times he even employed tubes measuring only 13 cm. The change in length has the advantage of improving the view, for the nearer we approach the object to be observed, the more clearly the details appear. In the same way, Ferron made tubes of varying calibers, even up to No. 48 Béniqué. These modifications are of interest, and must be used only in certain cases.

Among the other articles which have given most attention to this subject, the following may be read with profit: Those of Boari[33] of Ancona; Bickersteth;[34] Gauthier,[35] of Lyons; and finally the very interesting thesis of P. Jardon,[36] which appeared at Bordeaux in 1912, in which the author shows that "in many cases direct vision can be employed in the same way and with the same advantages as the

prism." As he further remarks, the use of direct vision cystoscopy "should be more widespread than it is at present."

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CHAPTER II

URETHROSCOPY

Importance of Urethroscopy.—Urethroscopy may be defined as the study of the urethral mucosa under the direct control of the eye by the aid of the urethroscope. In order to attain an exact idea of the utility of urethroscopy, and of the supreme importance of the direct examination of the urethral canal, it is necessary to understand fully the great service which this method of examination can render in the diseases of the urethra, and especially in that disease which is most frequent; namely, chronic urethritis.

Urethroscopy in Chronic Urethritis.—We know now that chronic urethritis is a purely local disease and that the foci of infection which perpetuate and prolong it are, in the vast majority of cases, thoroughly localized and circumscribed. A thorough knowledge and understanding of these foci, so that they may be treated according to their respective varieties, constitute the secret of the cure of chronic urethritis. The instruments and the methods designed to explore the urethra and its adnexa have been numerous, and have been employed over a long period of time; and among the methods of exploration, urethral endoscopy possesses a value of the highest order both in the diagnosis and the treatment of urethral disease.

The urethroscope is for the urethra what the stethoscope is for the heart, what the roentgen rays are for fractures, what the laryngoscope is for the larynx, what the ophthalmoscope is for the eye. While the stethoscope may not be needed in the diagnosis of a gross lesion of the heart, it is nevertheless true that this valuable instrument will enable us to determine and localize a faint cardiac murmur quite distinctly. Likewise though the diagnosis of a fracture can readily be made by a number of clinical and pathognomonic symptoms, it is equally true that the roentgen rays and the fluoroscope enable us in many cases to locate exactly the direction of the line of fracture and to determine the method of treatment, appropriate and beneficial to the patient. It is precisely in the same circumstances, but with a still greater need, that the urethroscope enables us to localize the lesion quite exactly at a particular portion of the urethra.

The scientific mind must be averse to instituting a method of

PLATE II

FIG. 1.—*Long eel-shaped polypus* on the anterior aspect of the verumontanum.

FIG. 2.—*Long phallus-shaped polypus* on the apex or crest of the verumontanum.

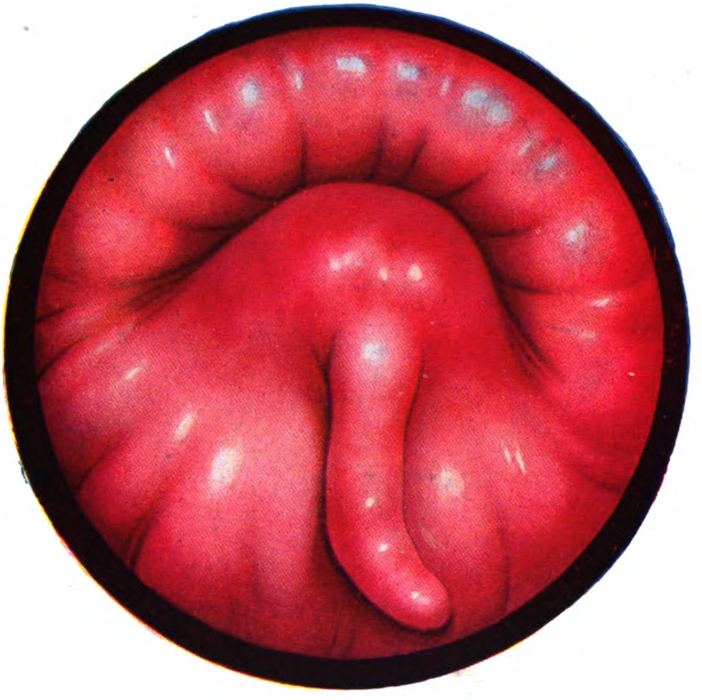

Fig. 1.

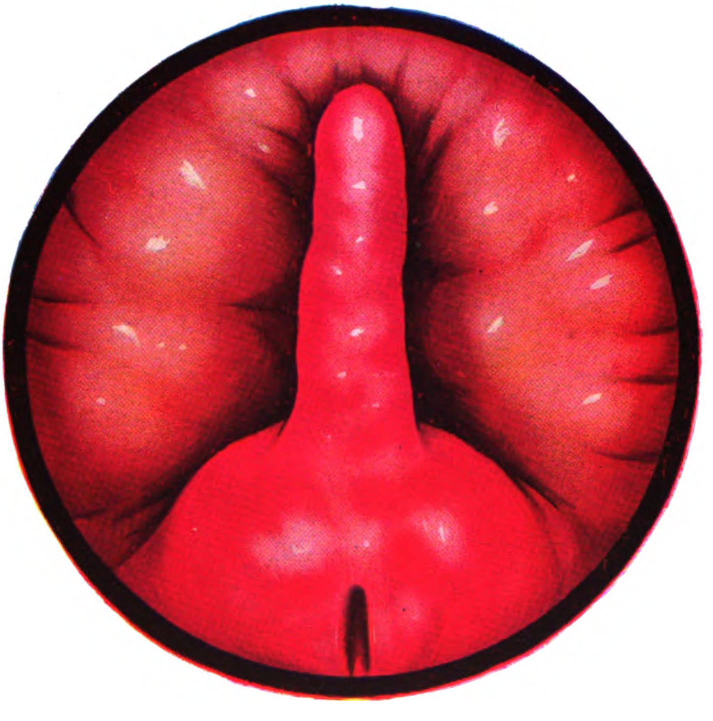

Fig. 2.

PLATE II

therapy against a pathologic entity which is not known in all its details. Such a procedure would be a step in the dark and would practically reduce the treatment of urethritis to an empiricism which is no longer in harmony with the present time.

The urethral walls are not visible naturally and only the gross urethral lesions are recognized through the means ordinarily employed. The aim of urethroscopy, however, is to *see* the localized urethral lesion,—to know its exact situation, as well as its size and shape. By this method of investigation we are enabled to apply to the urethral mucosa the principle of all rational surgery; namely, to make an exact diagnosis of the urethral lesions by looking directly at them and treating them subsequently according to the diagnosis thus determined. There is but one method by which the folds and recesses of the urethra can be studied and that is by looking at them directly through the urethroscope. This instrument better than any other brings to view the chronic foci by localizing the lesions in the urethra. It is true, of course, that the seat of the lesions in the urethra may be determined in a general way by examination of the urine and its shreds passed into several glasses, but this method does not tell us in which particular portion of the urethra the foci are situated, nor does it tell us anything of their character.

The anterior urethra is comparatively long and the methods of treatment applicable to its lesions vary considerably, and the instruments employed also differ considerably according to the location of the infection. Lesions of Littré's glands of the penile urethra, for example, are not treated in the same manner as inflammations situated at the bulb. And how can one be sure of the exact location if the lesion has not actually been seen with the eye? The urethroscope alone meets this demand. And we may add that besides the precision in the means of localization which urethroscopy offers, this method also affords the possibility of energetic local treatment applied directly to the lesions. The great value and importance of this method of therapy must be emphasized; and it is also proper to indicate how illogical it would be to attempt the treatment of a surgical lesion without seeing it.

Lastly, urethroscopy enables us to note clearly and precisely the results obtained during a methodical course of treatment. In urethral dilatation for stricture, the progress of the case can be followed step by step; and when bleeding takes place, we can not only locate the tear, but also determine the appropriate intervals for dilatation. As a matter of fact, so long as the tear caused by the dilatation is not entirely cicatrized, repeated dilatation merely separates the ends

of the tear without serving any benefit to the remainder of the urethral circumference. Beneficial when carried on prudently under the control of the urethroscope, dilatation may be of no actual value and even disastrous when it is done blindly.

It must appear after all that has just been said, that the criticisms generally aimed at urethroscopy must fall of their own weight. The argument so often made that urethroscopy does not teach us anything that we can not learn clinically, does not seem to us worthy of consideration. Just one glance at the drawings which we publish will suffice to indicate how the mysterious veil thrown over the etiology of certain refractory urethritides has been set aside by the use of the urethroscope, and it also explains the real reason for the check which older methods of treatment have received since its use has become widespread.

In the matter of accidents which may result from urethroscopy, such as epididymitis, cystitis, etc., they will be positively avoided if the proper technic is employed (see page 74). Urethroscopy should, of course, never be employed in the diagnosis of lesions which are acute, extensive, or recent; it should be utilized only under certain well-defined conditions which are specified later on; and, it may be added, if carried out with proper precautions, this method will never give rise to the least untoward complication.

Conclusion.—Urethroscopy must be accepted as a routine method of urethral exploration. From the standpoint of diagnosis it furnishes information infinitely more useful than any other method of investigation; and from the therapeutic point of view it enables the practitioner to act precisely as well as effectively. And finally, in the treatment of chronic urethritis it is absolutely indispensable.

Moreover, when endoscopy has been employed for some time in the urethra or the bladder, and when the operating and instrumental technic have been fully mastered, it is difficult to conceive why this valuable aid in diagnosis and treatment is not always utilized. Congested areas, ecchymoses, soft infiltrations of the mucosa,—all of these are beautifully seen; with patience and proper equipment one can enjoy the sensation of actually doing real scientific work, both surgical as well as useful.

The Importance of Urethroscopy in Determining the Absolute Cure of Urethritis.—It is needless to insist on the great importance of determining whether a patient is or is not completely cured of his urethritis. As we all know, this is a matter of vital interest, for it may be the means of avoiding terrible and even fatal consequences in the future. Undoubtedly, valuable information as to a cure can be de-

rived from a careful examination of the urine which has been retained several hours and a study of the filaments which it contains. Likewise, massage of the urethral glands and the exploration of the urethral mucosa stretched upon a curved Béniqué sound will also furnish most valuable information. But it is equally true that surprising relapses often occur, notwithstanding these tests. These relapses often can not be explained.

In cases where marriage has been permitted prematurely, fatal consequences may ensue. It is our duty, in every case of approaching marriage, to take every possible precaution to avoid future disaster. Among these precautions the most important is the minute examination of the entire urethral mucosa by means of the urethroscope. For it is only through this medium that we can obtain the most detailed and exact data, in order to determine a complete cure and thus deliver to the patient his "certificate of health" which will enable him to enter the marriage state in complete moral and physical security.

It may be safely stated that the perfect and sure cure of a urethritis should not be affirmed without a complete and minute urethroscopic examination of the urethral mucosa having been made.

Several instances mentioned further on, in which the gonococcus has persisted in the urethra over a period of many years without arousing suspicion, will demonstrate the absolute necessity of urethroscopic control before marriage is permitted. We can not do better than to recall the opinion of Oberlaender and Kollmann,[1] on this subject:

"However mild the case under observation may have been, one should not be content with a single examination in forming an opinion as to a cure; to the contrary, many examinations should be made, not only at an interval of several days, but for several weeks in succession, and on each occasion, the urethroscope must be employed, the patient not having urinated for five or six hours. Cocaine must not be employed. The entire canal should be examined from end to end. To be sure that the cure is complete, the canal, which has been examined, must fulfill these conditions:

"The mucosa must present normal folds, with perfect longitudinal ridges or furrows. There must be no difference in color between the parts originally affected and those which remained healthy. The epithelium should be bright throughout. The orifices of the lacunæ and of Littré's glands must show no evidence of irritation, and the periglandular infiltrations and the cicatrices of the deep-seated glands

should not appear at the mucous surface, but should present a healthy epithelial surface like the rest of the canal.

"Cicatrices which may have formed beneath the epithelium should be no longer distinguishable, but should be covered over with a normal epithelial surface."

Indeed when it is a matter involving so grave a responsibility as that of granting permission to marry, it is essential that every possible precaution should be taken, and we can not fail to subscribe most heartily to the indications laid down by Oberlaender and Kollmann. But it is true, nevertheless, that in many instances we can not possibly hope for a complete *restitutio ad integrum.* This is notably true, for example, in the case of strictures.

As soon as we are assured that there is no further possible contamination from the gonococcus or other organisms, and when this decision has been arrived at by the faithful use of the urethroscope, we may with reasonable assurance declare that there no longer exists any germ focus and that the proposed marriage may then be sanctioned.

REFERENCE

[1]Oberlaender und Kollmann: Die chronische Gonorrhöe, Leipzig, 1901, p. 168.

TECHNIC OF URETHROSCOPY

Preparation of the Instruments.—The examining table should be elevated, and whenever possible, provided with an adjustable back. Footrests or stirrups are attached to the front legs (Fig. 45). The instrument is made ready and tested, after having taken proper care to insure perfect working of the instrument, connecting wires, etc. The source of light for the small electric lamp varies. The light is usually derived from the city electric current by means of a rheostat, which regulates at will the amount of current in the lamp. The models of Heller (Fig. 46), Gaiffe (Fig. 47), Loewenstein (Fig. 48) and of Leiter are most frequently employed. In America, a "transformer" known as a "controller" or rheostat is generally used (Fig. 49). This regulates the tension of the current from zero up to 25 volts; it is practical and inexpensive.

When the city current is not available, a dry battery may be used. True, it is short-lived, but it is easily renewed (Fig. 50). Because of their small size they are easily carried about in the pocket; but their short life is a decided disadvantage. An electric turbine may also be employed, provided water under pressure is available, to make

the turbine rotate. The electric turbine consists of a dynamo with a magnet, upon the axis of which is provided a large aluminum ring. The inner surface of this ring is corrugated; two powerful jets of water falling obliquely and proceeding from two pipes placed one opposite the other, cause the rotation of the magnets and thereby produce the current.

Sigurta, of Milan,[1] has devised a very interesting method which can render great service when electricity can not be had. This apparatus (Fig. 51) is made up of a small dynamo, the action of which

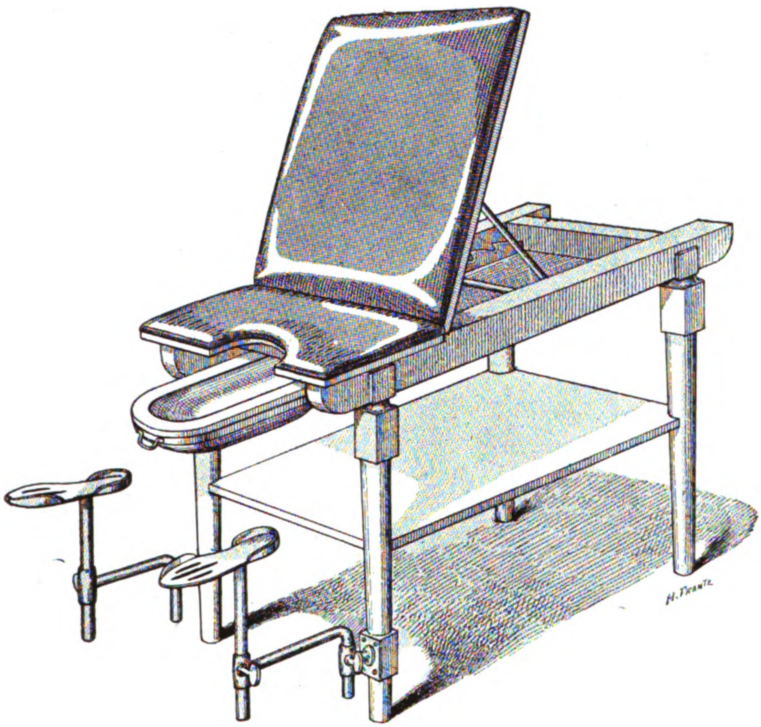

Fig. 45.—Urethroscopic examining table (author's model).

is produced by a flying gear, which is set in motion by the hand of an assistant. The rapidity of the movements transmitted to the dynamo determines the intensity of the current and the voltage of the lamp. A very sensitive indicator regulates the current employed.

The source of light having been provided, the handle of the urethroscope with its lamp, is connected with a cable to the rheostat and the current is turned on gradually until a white light is obtained in the lamp. The urethroscopic tubes are selected according to the individual case. If the anterior urethra is to be examined, a short 7 cm.

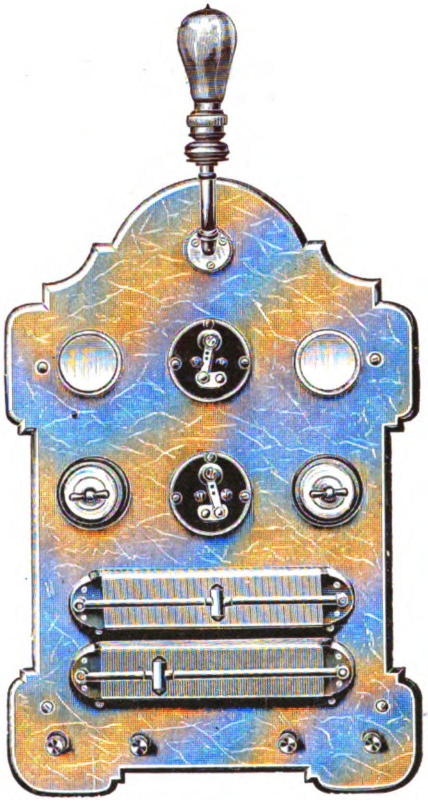

Fig. 46.—Rheostat for light and cautery adapted for city current (Heller).

tube is to be preferred, for a clearer view is thus produced. If, on the contrary, the entire urethra is to be studied, the long 13 cm. tube should be selected. For the posterior urethra and prostatic lesions

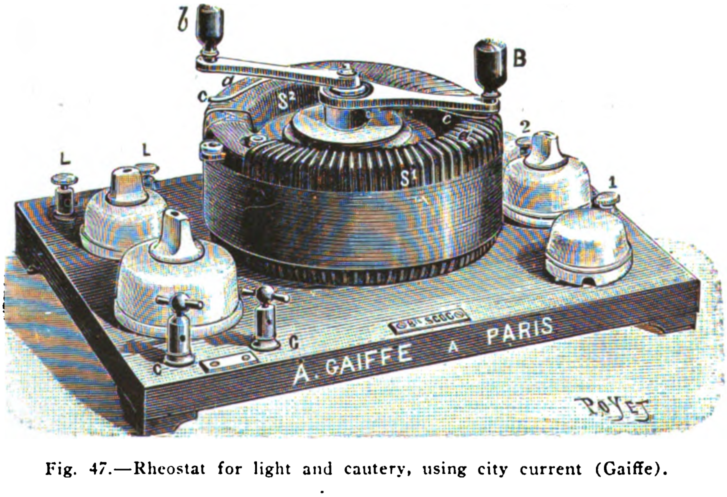

Fig. 47.—Rheostat for light and cautery, using city current (Gaiffe).

(veru) particularly, the longer 14 cm. tube will give the best results. It goes without saying that each of these various sized tubes is pro-

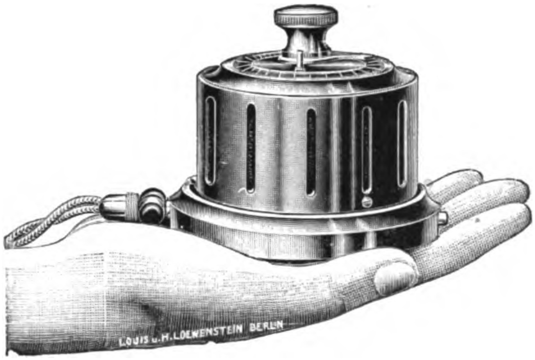

Fig. 48.—Rheostat for light, using city current (Loewenstein).

vided with a lamp carrier of corresponding length. The caliber of the tube most commonly used is 24 or 26, and even 28 French, if it

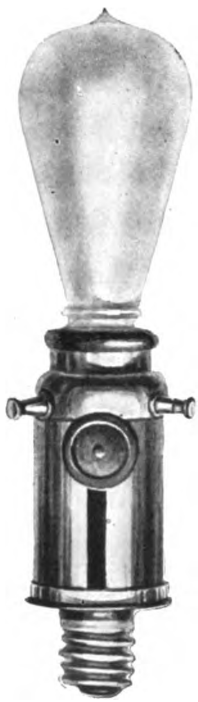

Fig. 49.—Light controller.

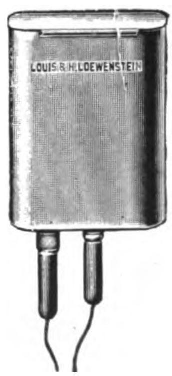

Fig. 50.—Pocket battery.

will pass the meatus. The magnifying lens corresponding to the focal length of the tube is now adjusted to the handle.

The special instruments required for the local treatment of the urethral lesions are placed on a table to the right of the operator, so that the diagnosis may be made and the treatment applied at the same

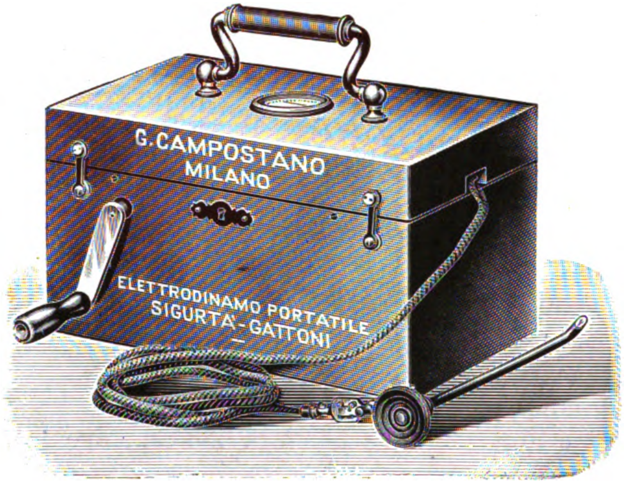

Fig. 51.—Sigurta's portable battery for electric illumination.

sitting. These instruments are the following: Wooden cotton carriers or applicators, both ends capped with cotton (Fig. 52); a pair of long forceps, designed for the recovery of cotton which may drop

Fig. 52.—Wooden cotton carrier.

from the applicator; a fine wire cautery and a Kollmann electrolytic needle. The tubes and their obturators are sterilized by boiling.

Preparation of the Patient.—The lower garments are removed

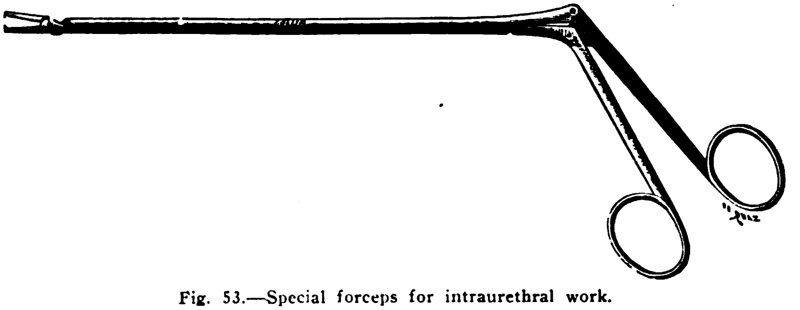

Fig. 53.—Special forceps for intraurethral work.

and the feet and legs encased in operating stockings. The bladder should be full preferably. The patient lies on his back, the feet rest-

ing in the stirrups, the buttocks drawn well forward to the edge of the table (Figs. 54 and 55). For the posterior urethra alone, the lithotomy position is to be preferred. The patient and instruments

Fig. 54.—Examination of the anterior urethra; showing position of operator and patient.

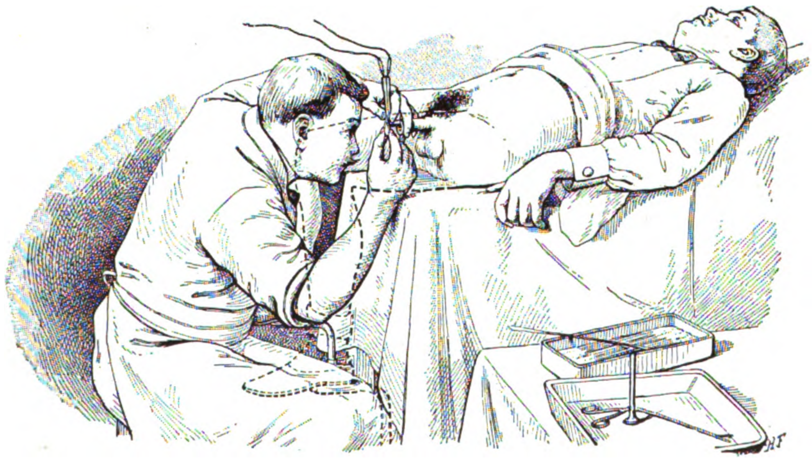

Fig. 55.—Examination of the posterior urethra; showing position of operator and patient.

thus prepared, the glans and the meatus are cleansed with a mild antiseptic solution.

Examination of the Posterior Urethra.—Previous to the urethroscopic examination, it must be determined that the meatus is large enough to admit the passage of the urethroscopic tube, and that there is no stricture in the urethra of a caliber sufficiently small to obstruct the tube. In the normal urethra, the meatus constitutes the narrowest portion of the canal; it may, therefore, be necessary to perform

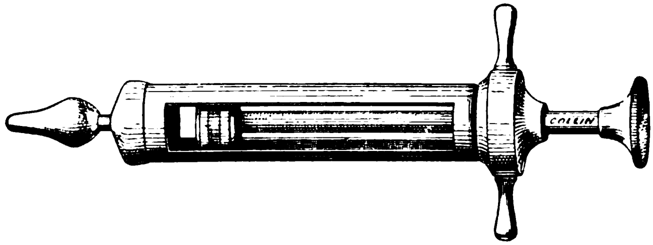

Fig. 56.—Ten c.c. syringe, for intraurethral injection of cocaine or stovaine; can be boiled.

meatotomy if the meatus is too small to permit the passage of a urethroscopic tube without pain.

Unless there are special indications, it is advisable that nothing be injected into the urethra before the examination, in order that any retained glandular or other secretions shall remain for observation and study. When the examination is complete, the urethra is washed

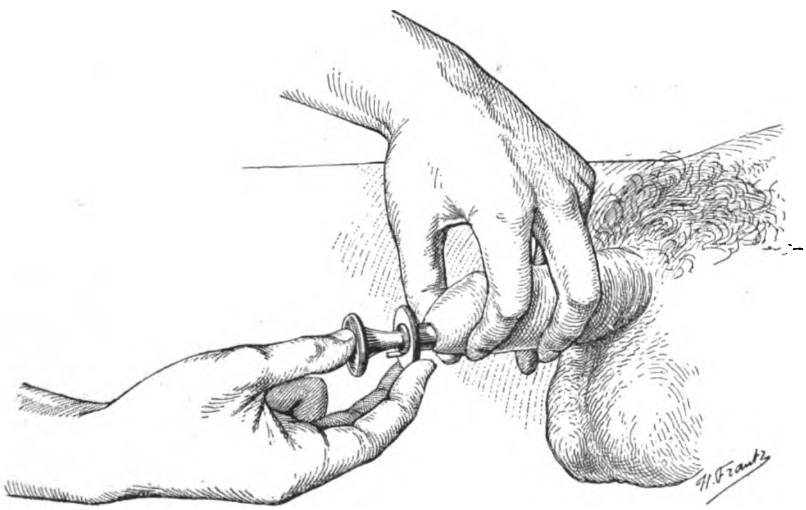

Fig. 57.—Introduction of the urethroscopic tube into the posterior urethra.

out thoroughly by the patient voiding the urine in the natural manner.

Occasionally, in sensitive or nervous patients, it will be necessary to anesthetize the urethral mucosa. This is best done by injecting into the anterior urethra 8 to 10 c.c. of a 1 per cent solution of stovaine with a syringe (Fig. 56). But this should be avoided so far as pos-

sible, as stovaine causes an anemia of the urethral mucosa which alters the urethroscopic picture materially. [In America stovaine is not regarded favorably for local anesthesia. Alypin 2 per cent is not toxic and does not blanch the mucosa. For the anterior urethra, one dram of the solution is injected, and retained for about five minutes, when perfect anesthesia is obtained. For the deep urethra, two or three ⅓ grain tablets deposited by means of a Bransford Lewis tablet depositor, will give most satisfactory anesthesia.—Editor.]

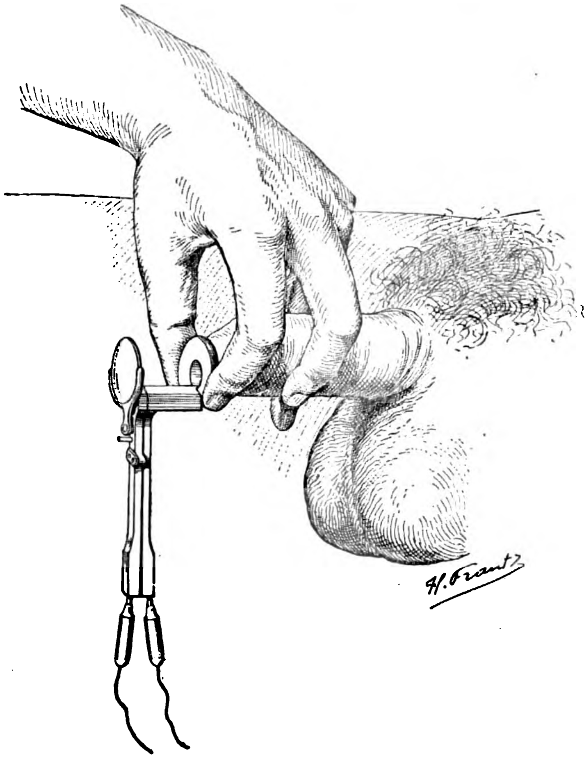

Fig. 58.—The urethroscopic tube having been introduced, the obturator is withdrawn and the handle is attached to the collar of the tube (lamp pointing downward).

Operative Technic.—The urethroscopic tube and its obturator, having been selected for the particular case, is sterilized and freely lubricated with sterile glycerin or jelly. The former, being transparent, has the advantage of affording a clear unobstructed view of the urethral mucosa. The tube is gently introduced down to the membranous urethra; its passage beyond this point is facilitated by making pressure with one hand over the hypogastrium, thereby lowering the subpubic ligaments.

The introduction of the straight urethroscopic tube into the posterior urethra has been regarded by some as difficult; some writers

have even insisted on preceding the introduction of the tube by the passage of an armed filiform guide. But this is really unnecessary in the vast majority of cases. In point of fact, it is agreed that introduction of the tube shall not be attempted unless the canal is sufficiently large to accept it, for as has already been pointed out, urethroscopy is useful and worth while only under this condition.

On the other hand, the position of the patient is important. He should lie on his back, the buttocks resting on the edge of the table, and his feet resting in the stirrups. The operator seating himself between the patient's legs, slowly passes the instrument vertically into the urethra. When the tip has reached the membranous urethra, the

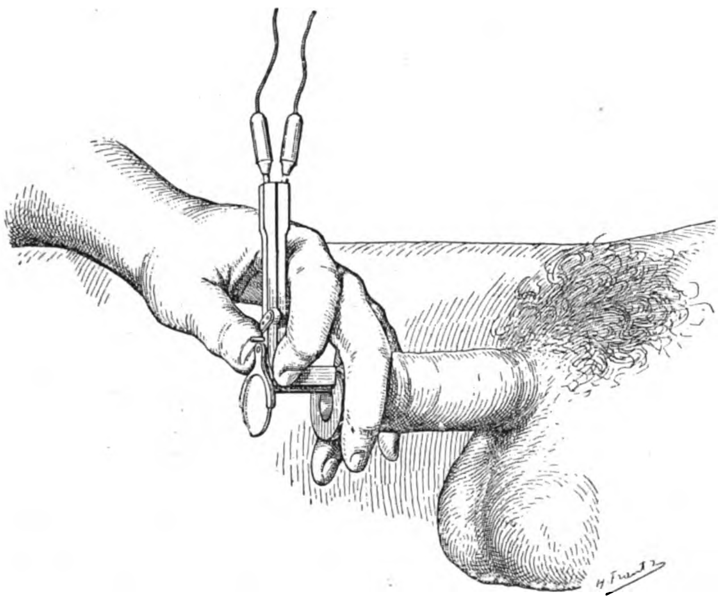

Fig. 59.—In the examination of the posterior urethra, the handle of the urethroscope is turned upward, the lamp also upward, to avoid the urethral secretions which gravitate down upon the lower wall of the tube.

handle is depressed so that the tube lies horizontally, and with a little dexterity it passes easily into the deep urethra (Fig. 57). When all resistance has ceased and the tube moves freely, we know that it has entered the bladder; further evidence is offered by the escape of urine through the tube.

The tube is now drawn forward gradually until the flow of urine ceases. The tip of the instrument is now in the deep urethra. The secretions of this part of the canal are now swabbed with the cotton carrier and when the mucosa is fairly dry, the lamp is inserted (Fig. 58) with the handle of the urethroscope pointing downwards. The tube is now rotated 180 degrees, so that the lamp rests on the upper sur-

face of the tube. In this way, the lamp is maintained high above the urethral floor, giving a better illumination, and it is kept from being obscured continually by the secretions on the urethral floor which should be studied carefully, and which would be encountered were the lamp not rotated in this manner.

The verumontanum is visible below and can easily be freed from accumulated secretions or blood by the cotton swab. This assures a clear and distinct view. Little by little the tube is drawn forward and all portions of the canal thus brought under inspection of the

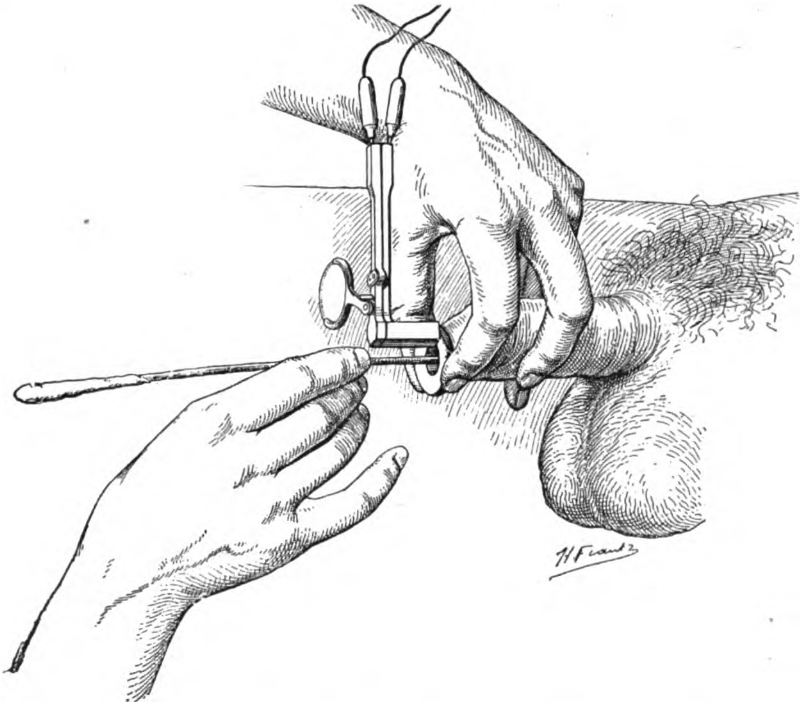

Fig. 60.—Intraurethral manipulation; drying the mucosa with cotton swabs.

observer. The urethral mucosa can be distinctly inspected with remarkable clearness by this method, owing to the cleansing with the cotton swab.

In the older urethroscopes with internal light, such as the Oberlaender, for example, it was necessary to withdraw the light each time before the applicator could be inserted; with this instrument, however, the lamp may not only remain in its place without causing any inconvenience, but in addition, it serves to aid and illuminate the necessary manipulation in the interior of the tube. It is, therefore, a simple matter to apply caustics and other therapeutic agents directly to the affected spot, owing to the direct view thus obtained (Fig. 60).

PLATE III

FIG. 1.—*Glandular lesions of the anterior wall of the prostatic urethra* as seen through the urethroscope. All the infected glands of the prostate are seen vesiculated and have the appearance of frog's spawn. Under dilatation, all the prostatic vesicles burst and disappeared, and a cure resulted.

FIG. 2.—*Glandular lesion of the anterior surface of the prostate,* seen through the urethroscope. Compare this picture with Fig. 1, Plate I, which represents the healthy condition.

Fig. 1.

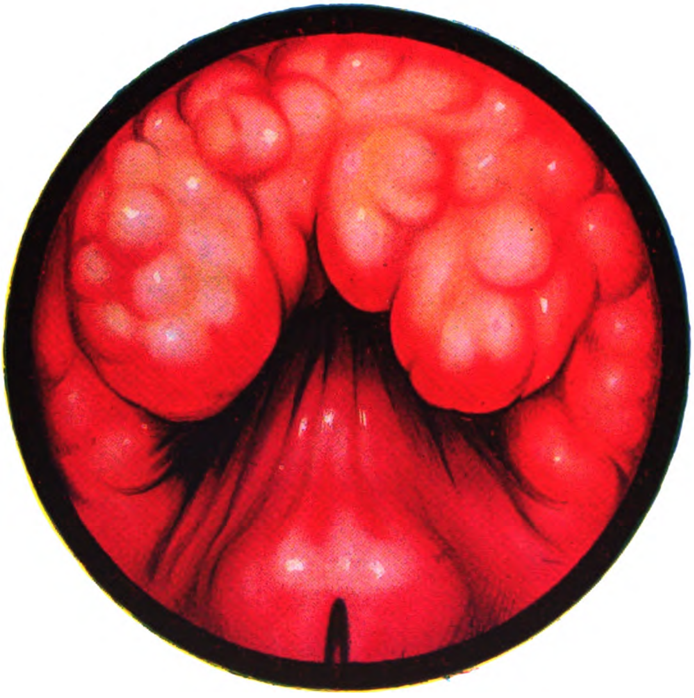

Fig. 2.

PLATE III

Contraindications to Urethroscopy.—Urethroscopic examinations should not be made recklessly in all cases of urethritis; in acute or recent infections the introduction of any instrument in an inflamed canal must be prohibited. This instrument may, therefore, be employed only when there is no pain on urination, or during erections, and when the urine is fairly clear. Nor should the examination be made while the urethra is still sensitive or tender.

Generally speaking, the urethroscopic tube should never be used unless we are familiar with the urethral caliber. It is extremely unwise to insert a urethroscopic tube into a patient who has been seen for the first time. There is always the risk of being stopped by a small meatus or a stricture in the urethra, with the resulting pain and hemorrhage. Urethroscopy should also not be undertaken while there are inflammatory complications of the posterior urethra, such as epididymitis, acute prostatitis, etc. Finally, as an axiom, *the urethroscope should never be employed in a canal which has not been previously studied and dilated.*

Concerning Adrenalin in Urethroscopy.—This is a valuable aid in urethroscopy, in cases in which there is an oozing of blood which renders the examination of a particular spot almost impossible. Swabbing with cotton is of no avail, owing to the persistence of the oozing, and it may even increase the bleeding, in some instances. The employment of adrenalin in these circumstances is strongly indicated. A cotton swab dipped in a 1:10,000 solution applied to the bleeding spot will quickly stop the oozing. But the surgical principle of hemostasis must be applied; that is, the exact bleeding point must be isolated and treated with the solution. If the adrenalin is applied in haphazard fashion, it will probably be of little or no avail whatever.

There is a decided disadvantage in using this medium, however; while adrenalin is a vasoconstrictor of a high order, a vasodilatation is produced just as soon as its ephemeral action has passed off, and this is capable of producing a secondary hemorrhage of an extremely disagreeable character. On the other hand, this solution must be used only drop by drop, and should never be injected into the urethra with a syringe. Johnson, of San Francisco,[2] reported a case in this connection in which hemorrhage followed a urethral dilatation. Johnson endeavored to stop the bleeding by filling the anterior urethra with a 1:4,000 solution of chlorhydrate of adrenalin. The patient suddenly became livid and motionless and his eyes became glassy; this was followed by vomiting and complete collapse, feeble respiration, pulse hardly perceptible and the heartbeat inaudible. After a few minutes the patient was revived with difficulty through the use of

strong hypodermic stimulant injections. For three hours he was unable to stand on his feet.

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[1]Sigurta: Di un nuovo apparecchio portatile independente per la produzione della luce elletrica per uso endoscopico, Atti della Societa Milanese di Medicina e Biologia, Milano, 1908, iii, No. 5.

[2]Johnson: Jour. Am. Med. Assn., Oct. 7, 1905, p. 1086.

URETHROSCOPY OF THE NORMAL AND PATHOLOGIC URETHRA

1. Urethroscopy of the Normal Urethra

General Observations.—Before entering on a study of the urethra, it is well to consider a few observations common to all portions of the canal. The consistency or thickness of the mucosa varies according to the individual to be examined. It is thinner and more delicate in individuals whose genital organs are small or atrophied; while, on the other hand, it is firmer and denser in vigorous subjects. The color of the mucosa also varies considerably in different individuals, ranging in the normal state from a reddish gray to blood red, according to the extent of vascularization.

The color differs also according to the caliber of tube employed. If a large tube is used, the pressure which it exerts on the mucosa is often sufficient to produce a distinct anemia and blanching of the mucosa. If the operator makes more or less pressure on one wall, he causes a localized paleness on that spot, which an inexperienced observer might regard as pathologic; but by moving the tube it is readily seen that the change in color is due only to the pressure of the tube on the wall. The local use of cocaine or stovaine will also produce an anemia of the mucosa.

A rather extensive experience in urethroscopy permits me to note a rather interesting phenomenon; namely, that the color of the mucosa seems to correspond with that of the face of the patient. Very often in the course of a urethroscopic examination when I noticed that the urethral mucosa suddenly became white, I observed that the patient's face became white at the same time and that he was about to faint.

Two distinct features of importance may be distinguished in every urethroscopic picture; i. e., the "central figure," and the mucous surface proper. The central orifice of the urethral canal constitutes the "central figure." Normally, the urethral walls are in apposition, so that its lumen is potential rather than real except while urine is pass-

ing through. When the endoscope is inserted, however, the urethral walls separate symmetrically at the lower end of the instrument, presenting an appearance resembling a funnel, the neck of which is made up of the center of the urethral canal and the sides are formed by the walls of the urethra proper.

This funnel is more or less distinctly defined according to the position in which the urethroscopic tube is held. When the hold on the tube is relaxed the funnel effect is but slightly visible; and when the tube is pushed downward against the pressure of the hand, the mucosa is drawn or pushed into the lumen of the tube and the funnel shape becomes still less marked and almost done away with entirely. But when the tube is drawn forward toward the meatus, the funnel becomes deeper and better defined, and if in addition, pressure is made on the penile urethra with the free hand, a very long funnel will be created which may even assume the appearance of a true cylinder.

There is a decided advantage in each of these methods of examining the urethra. In point of fact, when the mucosa in the tube is made to stand out prominently by pushing the tube downward, certain localized areas may be examined with great clearness; when, on the other hand, however, traction is made on the penis and on the urethroscope simultaneously, the lesions may be observed in profile. This method of examination is of considerable value when the purpose of the examination is to discover small chronic glandular inflammations which project slightly into the lumen of the urethra.

In order to see everything well, it is essential that all of these variations must be known to the observer. Similarly when a particular spot is to be examined carefully, the tube may be inclined on the axis of the urethra and an eccentric view may be obtained, if the central figure is still visible; but if the central figure has completely disappeared, only the urethral walls will be seen.

The aspect of this central figure varies considerably in different portions of the urethra. At the glans, it has the form of a little oval slit; in the penile region, it resembles a point; in the bulbous portion, it takes the appearance of a vertical slit; and finally, in the deep urethra, at the level of the verumontanum, it assumes a peculiar aspect due to the prominence of the verumontanum (Plate I, Figs. 2, 3, and 4).

The surface of the urethral mucosa presents a series of longitudinal folds or striations in the shape of wheel spokes. These folds are more or less marked according to the degree of stretching of the urethra and also according to the thickness of the tube employed. In the normal urethra they are quite well marked, but they undergo considerable modification in pathologic conditions.

In the normal mucosa the color of these striations is a more or less livid red, the striations forming beautiful bright red rays which merge gradually into the substance of the mucosa, which is of a light yellow rose color. The surface of the normal mucosa is smooth and brilliant throughout and it becomes irregular and dull in the pathologic state.

The orifices of the lacunæ of Morgagni are barely visible in the normal urethra; when visible, they appear in the form of little points or needle pricks slightly dilated, and are situated on the upper wall of the urethra. Likewise, the glands of Littré are practically invisible in the healthy urethra, and often are passed unnoticed in an examination of the canal. We shall see later on, however, that they change materially under pathologic influences; they become protruding, and congested, surrounded by a reddish zone, and easily visible.

2. Urethroscopy of the Normal Anterior Urethra

The central figure is practically the same in the entire anterior urethra, except that at the glans it has the form of a perpendicular slit, sometimes oval. In the pendulous portion, it has the appearance of a point, which often becomes enlarged and takes on the appearance of a transverse cleft studded with little indentations. The longitudinal folds appear like the spokes of a wheel. They are more easily visible if a narrow tube is employed and less readily recognized when a thick tube is used. In the region of the glans, where the urethral mucosa is smooth, they are not seen; they vary from four to six in number.

Longitudinal striation due to vascular ramifications is more marked in vigorous subjects. The lacunæ of Morgagni are situated on the upper wall of the penile region. Their orifices look like little pits having a color similar to that of the adjacent mucosa. Normally, their walls are not elevated above the neighboring mucosa. The large lacunæ, however, are easily recognizable, from the fact that they are V-shaped, the apex of the letter pointing downward and the arms bounding the walls of the follicle (Plate VIII, Fig. 2).

Littré's glands exist in great numbers on the entire surface of the urethra. Normally they are not visible and become so only pathologically. Cowper's glands open on the urethral mucosa through orifices which are rarely recognizable. Most often, they are obscured by the folds of the urethral mucosa.

3. Urethroscopy of the Normal Posterior Urethra

The tube having been introduced and the deep urethra cleansed with a cotton swab, the lamp is turned on and a distinctly characteristic

picture is observed (Plate I, Fig. 1, also Fig. 61). Above, we encounter the neck of the bladder, shaped like an infundibulum or funnel.

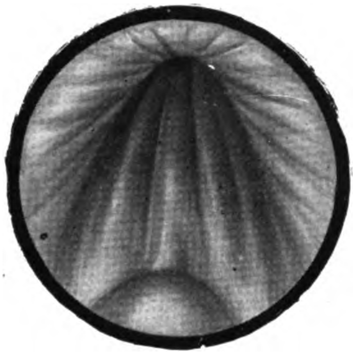

Fig. 61.—Urethroscopic view of the "prostatic fossette." Normal aspect of the posterior urethra situated between the verumontanum and the neck of the bladder.

From this point the folds of smooth mucosa descend in regular and diverging series in the shape of a fan. The handle of the fan is above; the body of the fan is below.

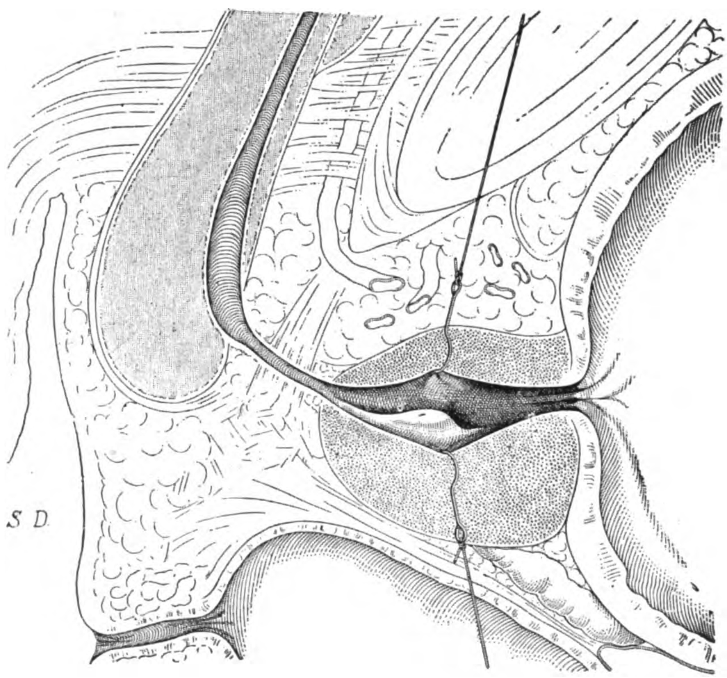

Fig. 62.—Anatomic view of the "prostatic fossette," comprised between the posterior margin of the verumontanum and the bladder neck.

Withdrawing the urethroscope gradually, the posterior aspect of the verumontanum comes into view. Immediately behind the verumon-

tanum is a little fossette, or space, which should always have a thorough examination. This prostatic fossette [postmontane space—Editor] should be explored methodically in cases of chronic urethritis, for it is very often the seat of chronic inflammations which can not be seen or even suspected by any other method of examination. This space is well shown in Fig. 62. Anteriorly it is bounded by the pos-

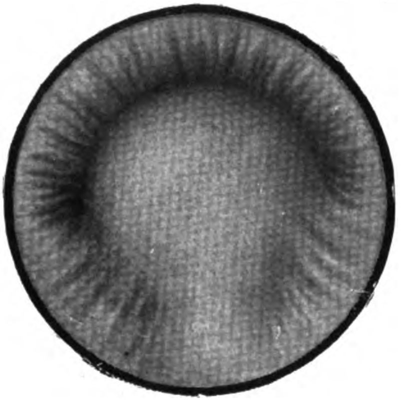

Fig. 63.—Normal verumontanum, the orifice of the prostatic utricle not visible.

terior wall of the verumontanum; posteriorly, it ends at the bladder neck; laterally, it is bounded by the urethral walls.

It has been maintained that this examination can not be performed properly with a straight tube, but this is not the case, for it is only necessary to depress the extremity of the tube slightly, seesaw

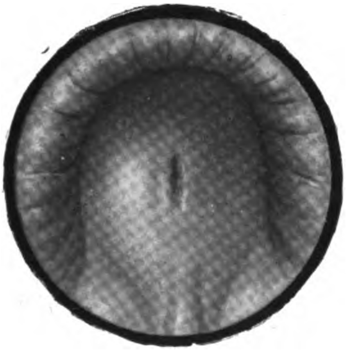

Fig. 64.—Normal verumontanum, the orifice of the prostatic utricle visible.

fashion by raising the handle and depressing the verumontanum. In this manner the posterior wall of the verumontanum can be readily examined. This done, the tube is gradually and gently drawn forward, thus bringing the body of the verumontanum into view. Its usual appearance is well shown in Plate I, Figs. 2, 3, and 4.

The Verumontanum.—The verumontanum usually appears in the form of a spindle elongated from before backward (Fig. 62). At times it takes the shape of a large projection bulging at the top; at other times it fills the entire lumen of the urethroscopic tube; occasionally only the anterior aspect can be seen, and when the tube is drawn forward somewhat further, it is seen diminished in height and breadth and becomes continuous anteriorly with its frenum. At times the prostatic utricle is not at all visible (Fig. 63) or only slightly so; while at other times to the contrary, it is clearly perceptible to the eye (Fig. 64). All of these varied aspects are beautifully shown in the colored plates.

In most instances the prostatic utricle is single and situated in the median line, the orifices of the ejaculatory ducts remaining invis-

Fig. 65.—Normal verumontanum, without a median prostatic utricle; the ejaculatory ducts terminate laterally, giving the appearance of a diver's helmet.

ible; but in many cases an arrangement quite different is observed. The utricle is not seen at the center, but the ejaculatory ducts are clearly visible, each orifice corresponding to the opening of an ejaculatory duct situated laterally and the entire verumontanum closely resembling a diver's helmet (Fig. 65). The importance of the examination and study of the verumontanum is exceedingly great owing to its intimate pathologic relationship with the seminal vesicles. This relationship is so close that the prostatic utricle well deserves the title which has been given to it; i. e., the "mirror of the seminal vesicles."

Above the verumontanum the picture changes suddenly. The urethral mucosa is arranged in folds and presents a characteristic aspect in the form of a swelling which occupies the entire upper part of the

urethroscopic tube; it forms a crescent, concave at the side, which surrounds the verumontanum. This fold is a very valuable guide in estimating the shape and size of the verumontanum.

As we move still further forward, the picture changes again. The anterior aspect of the verumontanum narrows little by little to the width of its frenum and completely disappears in the floor of the urethra. We now reach the membranous urethra. The regular schematic appearance of this part of the canal presents a central point which is the lumen of the urethra and from which the striations radiate. As the tube reaches this portion of the canal, it is tightly gripped and moved about with some resistance, but as it is brought still further anteriorly the resistance diminishes and the tube moves more freely again.

It is advisable to raise the handle of the tube gently as it leaves the membranous urethra, otherwise there is danger of the tube being thrown upward suddenly by muscular action, thereby causing the patient unnecessary pain. The observer now passes from the position indicated in Fig. 55 to that shown in Fig. 54.

The vast difference in the urethroscopic picture is now noted. The bulbous urethra gives its characteristic aspect. We see a vertical cleft very distinctly outlined. On either side are two smooth muscular projections diverging outward. This peculiar vertical slit is produced by the lateral compression exerted at this point by the bulbous and ischiocavernous muscles.

4. Urethroscopy of the Pathologic Anterior Urethra

General Observations.—The lesions of chronic urethritis viewed through the urethroscope were first described in a masterful manner in 1893 by Oberlaender, and in a later work in collaboration with Kollmann[1] published in 1910. We may also note the important works of De Keersmaecker and Verhoogen,[2] of Wossidlo,[3] and finally in France, of Janet[4] and of Fraisse.[5]

Oberlaender following the evolution of the gonorrheal process distinguished two distinct factors in the study of the chronic inflammatory lesions of chronic urethritis. The first is the soft infiltration (*infiltration molle*) characterized macroscopically by a turgescence of the mucosa and histologically by an infiltration of the submucosa with small cells, the entire process being accompanied by vascular dilatation.

The second factor which succeeds the first in the evolution of the pathologic process is the hard infiltration (*infiltration dura*), which is characterized macroscopically by a special paleness of the mucosa, which takes on a yellowish gray color, and histologically by the invasion

of the submucosa by small connective tissue cells which gradually take the place of the embryonic cells of soft infiltration and eventually transform the submucosa into fibrous tissue. The presence of this fibrous tissue strangles the blood vessels, stops the circulation, and brings about this particular discoloration of the mucosa.

The mildest degree of this type of infiltration corresponds to the large caliber stricture described by Otis, while the severest degree constitutes the true organic stricture of the urethra.

Soft infiltration accompanies and follows the inflammatory lesions of acute urethritis and is, therefore, found chiefly in the early periods of chronic urethritis. As a result through the evolution of the inflammatory process, the soft infiltration is eventually replaced by hard infiltration. Though there is no doubt that both forms are absolutely dissimilar, not only urethroscopically but also anatomically, they must in fact be regarded as successive phases of one and the same morbid evolution. Moreover, it is well to remember that both types can exist in the same urethra simultaneously.

It is well known that chronic urethritis is peculiarly characterized by the presence of distinctly localized areas of chronic inflammation. Each of these morbid processes can develop locally in an isolated fashion by itself. So that in a given urethra it is quite customary to see healthy mucosa alternate with portions attacked with soft infiltration and even with hard infiltration, as well.

Before taking up these urethral lesions, it is well to point out the most frequent points of localization of chronic urethritis; i. e., the middle portion of the penile urethra, the penoscrotal angle, and the membranous region. Indeed, several distinct areas may be involved at the same time.

Soft Infiltration.—There is no particular difficulty in introducing the urethroscope into a canal affected with soft infiltration only. At most the urethra may bleed slightly either during the passage of the instrument or while the lesion is being swabbed with cotton. The general appearance presented by the urethra affected with soft infiltration is that of a hyperemic mucosa, inflamed and turgid. Usually it is smooth and glistening (Plate VII, Fig. 5). It is best compared, for purpose of illustration, with a mass of inflamed hemorrhoids.

The color varies from dark red to blood red and "cyanotic" red. Soft infiltration is most often localized in irregularly disseminated centers, most commonly in the prostatic and membranous regions. These centers vary considerably in size, ranging from the size of a small gold chain link to several centimeters in diameter. The number of the foci is also variable; they may be single or more frequently

multiple, and in the vast majority of instances are separated from one another by intervening healthy tissue. Their shape is distinctly irregular; the margins are not well defined, but are fused with the healthy tissue surrounding them.

The epithelium at first has a brilliant luster; but when the lesions have persisted for a certain length of time, it desquamates or at least becomes thinner and more fragile. It then loses its luster gradually and becomes opaque and roughened. In places it may disappear entirely, and the papillary layer thus exposed begins to proliferate, giving rise to little granulations analogous to but less marked than those which are encountered in skin wounds. These petty granulations appear in the guise of little reddish irregular specks, the surfaces of which are red and bleed easily on contact. They are very numerous at the bulb.

The longitudinal folds of the mucosa are materially changed. Instead of the numerous folds which are usually found on the healthy

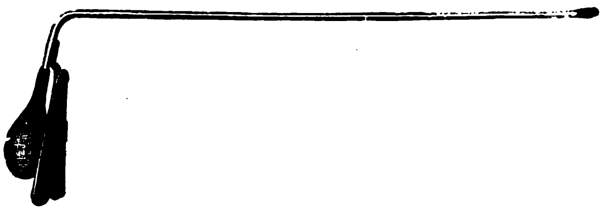

Fig. 66.—Kollmann's pipette, for aspirating the glandular secretions.

mucosa, only two or three are seen, and these are but poorly outlined. They project into and even obstruct the lumen of the canal. The longitudinal striation is hardly visible; it is lost in the hyperemia and tumefaction of the mass, the latter appearing only as a uniformly smooth surface.

The central figure is almost always closed, so that the aperture can not be seen, even when the tube is being withdrawn. The lacunæ of the Morgagni and Littré glands are always involved in soft infiltration. The inflammatory process gives rise at first to an increase in the glandular secretion; their mucous covering is red and slightly puffed up. Their excretory orifices appear like red projections as large as a pinhead, forming a little tumefaction with raised and glassy borders. A mucous or purulent secretion may be seen escaping from these orifices; this secretion can be collected for microscopic examination by means of the pipette devised for this purpose by Kollmann, of Leipzig (Fig. 66). The lacunæ of Morgagni form a projection at the surface of the mucosa which may attain the size of a small pea; or they may appear like a nodule, the size of a pinhead, on the top of which a

little opening may sometimes be seen. The edges of the latter are swollen and translucent and a mucous or purulent secretion may be seen protruding from their orifice.

Papillomata may often accompany soft infiltration. Usually small and isolated, they may, nevertheless, be long, thin and fragile, or short and thick, projecting into the lumen of the urethroscopic tube. They usually resemble the type so often seen on the prepuce. They are produced as the result of the excessive proliferation of the mucous derma where they are exposed by the desquamation of the epithelium.

Occasionally they are gathered together in little heaps, even to the point of obstructing the lumen of the canal. Their favorite site is in the bulbous urethra or near the verumontanum. In one case, Oberlaender saw them extend over the entire length of the urethra and even invade the bladder. Grünfeld described these papillomata in his work on endoscopy.[6] Several of these are shown in Plate II, Figs. 1 and 2.

In the case of a young man aged twenty-six years, referred to me by Hartmann, with a chronic urethritis of two and a half years' dura-

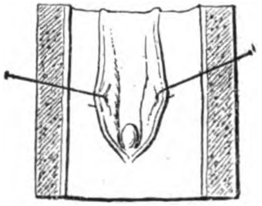

Fig. 67.—Little polypus situated at the bottom of a lacuna of Morgagni.

tion, urethroscopy revealed a large lacuna of Morgagni on the anterior wall of the penile urethra near the root, partially destroyed. Two floating shreds were attached to the bottom of the lacuna. On careful examination, a little budding polypus was seen near the attachment of the shreds, which constituted the debris of the destroyed lacuna (Fig. 67).

Hard Infiltration.—As opposed to what occurs in soft infiltration, the introduction of a urethroscopic tube in a urethra affected with hard infiltration, presents a degree of resistance more or less accentuated according to the amount and character of the infiltration. At times this resistance is so marked as to obstruct the introduction of even the smallest tube. In such cases we are dealing with a tight organic stricture.

Lack of resilience is characteristic of all hard infiltrations; this being due to the progressive transformation of the cell infiltration in the surrounding tissues. In proportion as this adjacent tissue becomes

PLATE IV

FIG. 1.—*Glandular lesions of the anterior portion of the prostate*, as seen by the urethroscope. The infected prostatic follicles instead of being vesicular and like the spawn of a frog, as in Fig. 1, show themselves here in the form of real little abscesses.

FIG. 2.—*Little polypus* situated on the apex of the verumontanum.

FIG. 3.—*Pathologic aspect of the anterior surface of the chronically inflamed verumontanum.* When a verumontanum is seen through the urethroscope so deformed and inflamed, it is reasonably certain that an accompanying inflammation of the seminal vesicles exists. "The urethroscopically pathologic verumontanum is the mirror of the seminal vesicles."

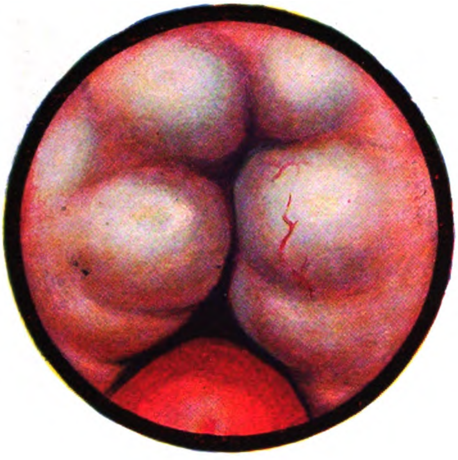

Fig. 1.

Fig. 2.

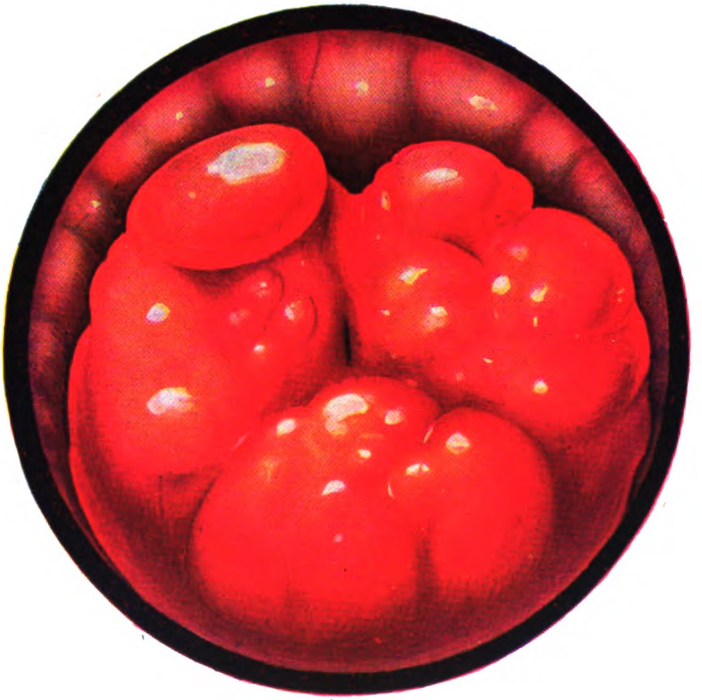

Fig. 3.

PLATE IV

more dense and compact, the blood circulation of the mucosa is altered and the tissue loses its normal color and elasticity. In extreme degrees of hyperplasia of the adjoining tissues, the mucosa becomes hard and unyielding.

The general appearance presented by a mucosa involved in hard infiltration is characterized by a distinct diminution in color from bright red to pale pink (Plate VI, Fig. 2, and Plate VII, Fig. 6). The color of the mucosa at first pale and anemic, appears in the most severe cases grayish or even yellowish, and later on, in cases of true stricture it becomes uniformly grayish white. These various modifications in color depend on the more or less active proliferation of cells in the surrounding tissues. As it increases in thickness and density, this infiltration brings with it more or less marked changes in the blood circulation which becomes impeded in varying degree. This fibrous tissue chokes the vessels and thus obstructs the blood stream. It is thus readily seen that in cases of true stricture,—those in which the urethroscopic examination can not be made without previous dilatation, the mucosa appears uniformly pale yellowish in color with an appearance generally resembling gangrene.

As in the case of soft infiltration, the site of the trouble is distinctly localized; the most common sites are the midpenile region, the penoscrotal junction particularly, and the membranous region. Histologically the fibrous tissue is found principally near the glands; but it may also appear more rarely, in the mucous tissue itself. This tissue then manifests itself in the form of little cicatrices about one centimeter in extent or in the shape of little stars from one to two millimeters in size.

Degree of Hard Infiltration.—The intensity of the infiltration being variable in degree, the exact measure of its extent is extremely difficult, if not impossible, to determine. Oberlaender distinguishes three degrees: 1. That in which the canal preserves its normal caliber. 2. That in which the canal though narrowed still admits a No. 23 urethroscopic tube. 3. That in which a No. 23 tube can not be introduced.

Though this classification is purely arbitrary, nevertheless, it is one which can be readily applied with considerable satisfaction. A more simple though less exact classification can be adopted which takes into consideration but two types: mild types corresponding to the large caliber stricture of Otis, and the more serious type, or true stricture. In reality there are so many transitional forms, which develop from the simple mild type to the real organic stricture, that it is difficult to establish clean-cut and well-defined classifications.

The epithelium in hard infiltration presents pathologic changes

which are due to its defective nutrition. In the first degree infiltration, the epithelium loses its luster and transparency and takes on a dull appearance. In a more accentuated degree of infiltration, a process of desquamation takes place due to a proliferation of the epithelium, these phenomena being found especially marked at the point most diseased. The epithelial surface of the urethra then appears irregularly roughened, presenting small projections of about a millimeter in height surrounded by rather large depressions which bleed easily on contact. The epithelial proliferation results in the formation of little specks, fairly well marked, generally round and of peach gray color. They are of various sizes; sometimes very small, about the size of a pinhead, being barely distinguishable from the surrounding mucosa; occasionally they are thicker by several millimeters, being about a centimeter in length and standing out prominently from the adjacent tissues. However, instead of producing these small spots, the proliferation may extend contiguously to more than half of the urethra. In such event, a corneous infiltration of the urethral epithelium is the result and we have to deal with a thick, proliferated surface known as pachydermia or leucoplakia.

In these cases the mucosa becomes dull, grayish in color, with an occasional spot showing the original rose color of the mucosa. The latter looks as if it were covered with a layer of gray powder.

Urethral leucoplakia becomes localized usually in the form of plaques of varying extent with regular edges; they are easily distinguished by their lustrous white, yellowish white, or grayish white color. Their surface is not smooth, but granular and "angry." The plaques are oval in outline with their major axis directed lengthwise with the urethra. When they are rubbed with a cotton swab it is seen that they are rather adherent. The superficial layers may be easily detached and then the deeper mucous layers will appear dark red, dull, and wrinkled and do not bleed easily.

The longitudinal folds of the mucosa diminish considerably in the course of hard infiltration, and may even disappear entirely in the serious cases which terminate in stricture. Urethroscopically the urethra assumes the appearance of a rigid pipe which remains open when the urethroscope is withdrawn, due to the fact that it is a tissue without elasticity with stiff and smooth walls. The central figure is nearly always transformed into a funnel with deep and rigid walls. In true stricture this funnel may measure one to two centimeters in depth. The picture is then absolutely characteristic. The urethral walls, retained by the fibrous tissue which surrounds them, do not come in contact with one another as in the normal state, thus creating a funnel, or

better still, a tunnel with smooth pale walls of the apparent consistency of cardboard. The lesions observed in hard infiltration are well shown in Plate VI, Fig. 2.

Glandular and Lacunar Lesions.—The lacunæ of Morgagni and the glands of Littré are always attacked in varying degree in hard infiltration. Agreeing with Oberlaender, we may distinguish two forms, quite different from each other: (A) The excretory duct remains patent, and in this case the contents of the gland can run off and escape; this is called the "glandular" type. (B) The excretory duct becomes obstructed by compression from the neighboring tissues or by retraction of its own walls; the secretion products are then retained and accumulate in the follicle, thus transforming it into a little cyst. This is known as the "follicular" or "dry" type. This term "dry" is applied because of the appearance of the mucosa deprived of its glands; but it is accompanied almost invariably by a more or less purulent and tenacious discharge.

(A) In the "glandular" form the orifices of Littré's glands appear enlarged and surrounded by an inflammatory ring. The orifice has the appearance of a crater and often gives forth a watery secretion. On gentle pressure of the extremity of the urethroscopic tube the lips of the orifice will often gape and a purulent and sometimes a clear liquid will emanate from them. Occasionally these orifices attain enormous size and the pressure of the examining tube will produce a veritable "shower."

Morgagni's lacunæ likewise present somewhat similar changes (Plate VIII, Fig. 3). The edges of their orifices assume a crater-like mouth, from which a mucous or purulent secretion oozes. If on the other hand the perilacunar infiltration is very highly developed, the excretory ducts of the lacunæ project above the level of the mucosa and appear in the visual field in the form of little red protuberances. Where dilatations have already been instituted, it is not unusual to see the glandular or lacunar orifices which are enormously enlarged, split apart with cracked walls. This condition may explain the frequent exacerbations which frequently follow the first dilatations.

Nor is the following history unusual in these cases: A patient presents himself with a very slight discharge, sometimes nothing more than the "morning drop." The urine being clear even in the first glass, and there being neither pain nor any other contraindication against the urethral examination, the physician introduces the bougie or some other metallic instrument into the urethra in order to determine the presence of possible centers of induration. Two days later the patient returns in surprise with an abundant discharge which contains numer-

ous gonococci. Occasionally in the midst of recriminations addressed to the physician, the latter is accused of having produced the contamination by the use of infected instruments. In reality the true explanation of the occurrence is anything but that, and very simple for any one who is familiar with urethroscopic investigation.

When observed through the urethroscope, Littré's glands and Morgagni's lacunæ often appear in the form of little cysts having rather thin walls. These little cysts may harbor gonococci for a very long period of time, and so long as they are not touched, the microbes may remain shut up within their thin walls; but it is readily seen that when an instrument is passed into the canal and causes the cyst walls to burst, the gonococci spread themselves over the urethral mucosa and infect it over again.

(B) In the "dry" or "follicular" form, as a result of the pressure exerted by the invasion of the adjoining infiltration, the excretory ducts of the glands are closed and the glands themselves obliterated in such a fashion that they are thus transformed into little subepithelial cystic cavities filled with a colloidal substance. These glands are at times transformed into real little purulent cysts which may be disseminated or grouped together into one or more heaps.

Some very characteristic views of these lesions when the glands have been invaded by the infection may be seen on Plate VIII, Figs. 1 and 2.

In these illustrations, the subject was a young sergeant major, twenty-five years of age, stationed in Paris. He had a discharge of fifteen months' duration for which irrigations and injections were of no avail. Clinically there was nothing but a slight discharge, while the clear urine contained but a few filaments limited to the first glass. The urethra accepted a No. 21 bougie easily. Inspection of the penile urethra through the urethroscope resulted in the discovery of a series of numerous little white spots which gave the mucosa a granular appearance resembling a flower bed of purulent whitish points. Individually each one of these points was very small, but there were many of them; each one represented an inflamed Littré's gland filled with purulent contents.

Considering the infinite number of affected glands, it was impossible to dream even of attacking them singly. It was decidedly more rational to treat them locally but *en bloc.* This was accomplished by gross dilatation with the Kollmann straight dilator. In two months there was a great improvement, but he was not yet cured. Another urethroscopic examination was then made, and revealed an exceedingly interesting state of affairs: At the penile urethra the mucosa had recovered its normal appearance, and the many little purulent cysts had disappeared owing in all probability, to the fact that the maximum amount of dilatation had been accorded this portion of the urethra by the complete separation of the arms of the Kollmann dilator. On the other hand, in the remaining portion of the urethra nearer the meatus which had not received so thorough a dilatation, the little pus-bearing cysts were still visible as before.

The disappearance of a large number of these purulent cysts through dilatation had brought about a notable improvement, but the cure could not be complete since the former condition had not been *entirely* removed. However, dilatation at the only points which still

remained infected resulted in restoring the mucosa to its normal appearance and with it gave the patient a perfect cure.

These cysts (Plate VII, Fig. 3) may be much larger in size so that they may project into the lumen of the urethral canal. They may burst under the eye of the observer by the mere pressure of the urethroscope, inundating the urethroscopic field with their contents.

The following is a case which is not at all rare, as I have observed it several times, particularly in the case of a patient of Dr. Cheurlot. This man, twenty-six years of age, with an attack of urethritis of one and a half years' duration, had a number of these cysts throughout the entire penile urethra. Methodical dilatation succeeded in causing the complete disappearance of the lesions and the patient was entirely cured.

I have encountered a still more typical case in which Littré's glands were changed into cysts similar to that illustrated in Plate VII, Fig. 3. The history of the case is as follows:

The patient was a young man of twenty-five, who had had a discharge for eleven months. Examined microscopically it was found to contain only leucocytes and cells. The urine was clear, but contained large heavy shreds limited to the first glass. The urethra, though presenting spasmodic resistance, was, nevertheless, absolutely free to No. 20. A series of silver nitrate instillations produced almost no result. Urethroscopic examination of the anterior urethra showed, in the midpenile portion, a considerable number of enlarged Littré's glands making a slight projection into the lumen of the urethroscope and apparently covered over by a fine whitish cuticle. One of these glands was quite large and distinctly appeared to be a typical cyst. This is shown in the picture above referred to.

Methodical dilatation of the anterior urethra with the Kollmann dilator was made over a period of three months. At the end of that time No. 44 had been reached without untoward incident and the patient had no longer any trace of discharge. The urine was clear and without shreds. Finally, a urethroscopic examination demonstrated the complete disappearance of all the cysts in the penile urethra and an absolutely normal mucosa in that portion of the canal.

Numerous cases are encountered of the dry or follicular variety in which the excretory ducts of Littré's glands are obliterated, but in which, nevertheless, the glands still project through the mucosa and are consequently still visible through the urethroscope. Quite numerous also are the instances in which the proliferation of the urethral epithelium and of the surrounding infiltration at the mucous surface is so great that the glands are forced back into the deeper structures. These are the cases, and they are by far the worst, which offer the greatest resistance to treatment, and are the most difficult to cure.

Palpation of the urethral mucosa stretched over a Béniqué sound gives very exact and important information in these cases. Indeed when the sound has been inserted into the urethra, if the lower wall of the urethra is palpated, many very clear small projections will often

be discovered. These are usually separated from one another, rounded like little cysts, and vary in size from that of a millet seed to a hempseed. At times they may attain a size approximating a hazelnut, or even a walnut. They may rupture externally and ultimately result in a urinary fistula.

Having observed the exact location of one of these little projections in the urethra with the sound, the urethroscope is introduced and the appearance of the mucosa at that particular point carefully studied. By inclining the tube laterally so as to put the mucosa on the stretch, nothing more than a smooth mucosa with few if any glandular orifices visible will sometimes be seen. This fact proves that the gland has been completely obliterated and that it does not any longer communicate with the mucosa.

The following case is absolutely typical of these conditions:

A young externe of the Paris hospitals, twenty-four years old, contracted a gonorrhea and had been treating it for three months. At the end of that time, there was no discharge except a slight morning drop. When he came to me on October 5, 1903, he complained of having noticed for three weeks past, a little tumor situated on the lower surface of the urethra about five centimeters from the urinary meatus. This little tumor, at first the size of a pea and of a consistency of a lead shot, had suddenly increased in size during the preceding six days and had attained the size of an olive. The pressure produced by this swelling had caused edema of the foreskin; rupture of the mass with a subsequent urethral fistula seemed inevitable.

In the presence of these well-defined symptoms I decided to make an examination with the urethroscope. The tube having been introduced rather deeply and withdrawn gradually I was enabled to recognize a distinct point which indicated that I had reached the tumor. I noticed this curious fact,—that while the swelling was as large as an olive and bulged clearly and distinctly externally, it projected very slightly if at all, into the urethroscopic tube. Bringing the tube to the level of the tumor, I cut the mucosa deliberately with a small Kollmann knife and plunged the blade into the swelling. In spite of a rather large incision, nothing but blood appeared. I then fixed the tube and the penis with one hand, and made pressure firmly on the tumor with the other hand, and squeezed it quite vigorously. All at once I saw a slough of flimsy stuff shoot forth which closely resembled the slough squeezed out of a furuncle. The tumor diminished in size slightly for the moment but it was still quite large and presented a fibrous shell of great resistance and toughness.

The after-effects of the operation were quite uneventful. The edema disappeared some days afterwards, and the patient was soon able to commence methodical dilatation of his anterior urethra with straight sounds. This dilatation was pushed up to No. 60 Béniqué. I saw the patient five months later, i. e., in March, 1904. He then no longer had any discharge and in place of the tumor nothing could be felt except a little fibrous core about the size of a hempseed.

This case is interesting in more than one respect: It teaches the following: 1. That when the glands have lost their communication with the surface of the urethral mucosa, urethroscopy gives no information as to their location and condition. 2. That the contents of these follicles is not fluid, but, on the contrary, is made up of a slough similar to that of a furuncle. 3. That the fibrous infiltration surrounding the

glandular walls constitutes the essential characteristic of these cysts. 4. That it is easy, with the aid of the urethroscope, to attack these glands surgically when they threaten to suppurate. In this way, spontaneous rupture externally might be avoided and thus prevent the development of a consequent urinary fistula.

The excretory ducts of the lacunæ of Morgagni also may become obliterated and eventually become choked up with their contents. The urethroscopic appearance is absolutely typical. The glandular orifices are barely seen, if at all. Here and there instead of a lacunar orifice a small grayish or yellowish depression is noticed indicative of a closed follicle and which resembles a little button about the size of a millet seed. These are the follicles which can be felt on external palpation of the urethra.

I have had a case of this kind (Plate VII, Fig. 4) in which there was an apparent obliteration of a lacuna of Morgagni. It occurred in the case of a man, twenty-nine years of age, who had had a chronic urethritis for a year, characterized by a urethral discharge and multiple points of infection; i. e., chronic prostatitis, hard infiltrations in the perineal region, and glandular and lacunar lesions in the penile urethra. On the upper wall of the urethra, urethroscopy revealed a small, smooth oval projection about as large as a grain of corn covered over with a yellow mucosa and presenting only some reddish striations.

Dilatation of this lesion, even with the straight Kollmann dilator up to No. 42, produced no appreciable effect and its appearance after treatment was practically the same as before it was begun. Two or three applications of Kollmann's electrolytic needle quite close together sufficed to bring about a cure at one sitting; after this application, not a single trace of the lesions could be observed.

It is not rare to find the glandular and dry varieties of hard infiltration in the urethra at the same time. This constitutes the "mixed" type. Exceptionally this mixed form is found at the very beginning before any treatment has been instituted. Most frequently it is observed when the dry variety is treated by dilatation; in such cases the cysts open and become atrophied or destroyed; the excretory glandular ducts that have become free open externally and gradually we thus pass to the "mixed" and subsequently to the glandular type.

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5. Urethroscopy of the Pathologic Posterior Urethra

In all cases of chronic urethritis it is absolutely necessary to examine the entire posterior urethra and not to limit the examination to the anterior surface of the verumontanum; the entire prostatic fossette [postmontane space] beginning with the neck of the bladder must likewise be examined and studied thoroughly.

Clinically this particular portion of the canal does not present any special symptoms; nevertheless, it is often surprising to see lesions of the posterior urethra that pass entirely unnoticed even by competent physicians and which can not be discovered by any other means than the urethroscope. Very often when the patient does not complain of any special sensation on the part of the prostate and when his second glass of urine is clear without shreds or filaments; when the rectal examination does not disclose any marked inflammation of the prostate and when even the most energetic massage of the prostate brings forth but very little prostatic secretion and this, almost normal,—even in these circumstances, where everything combines to force the conclusion that the posterior urethra is normal, such may not be the case. In point of fact, a urethroscopic examination of the posterior urethra often reveals the fact that well-marked lesions exist in the posterior urethra which, properly treated, will bring about a complete cure in cases hitherto believed to be almost incurable. In these instances, if chronic prostatitis is not responsible for the lesions, then surely chronic posterior urethritis must be the etiologic factor.

In an interesting article, Wolbarst, of New York,[1] has also justly insisted on the necessity of examining the verumontanum with the urethroscope in all cases of chronic urethritis. In his opinion, it is essential in all cases of spermatocystitis to treat, not only the seminal vesicles, but also to treat thoroughly the verumontanum and the ejaculatory ducts by means of the urethroscope. This author has published reports in which he demonstrated the fact that treatment of the seminal vesicles alone is not sufficient to bring about a complete cure and that it is absolutely necessary to examine and treat the verumontanum locally as well.

The local urethroscopic treatment which he recommends is the direct application of a 10 per cent solution of silver nitrate or dilute

tincture of iodin; also applications of the galvanocautery and Oudin's high frequency current (sparking).

Soft infiltration is the most frequent lesion encountered in posterior urethritis. The mucosa is hyperemic, congested, and bleeds easily on the slightest contact. The verumontanum involved in soft infiltration is dark red in color, swollen, and increased in size. It takes on a smooth appearance and becomes distorted in shape. The orifice of the prostatic utricle is open-mouthed, inflamed, and gives forth a mucous or purulent secretion. Very often the swelling of the verumontanum is so pronounced that this orifice as well as those of the ejaculatory ducts, is lost in the thickened mucosa, and remains hidden from view. When these orifices and those of the prostatic follicles can be

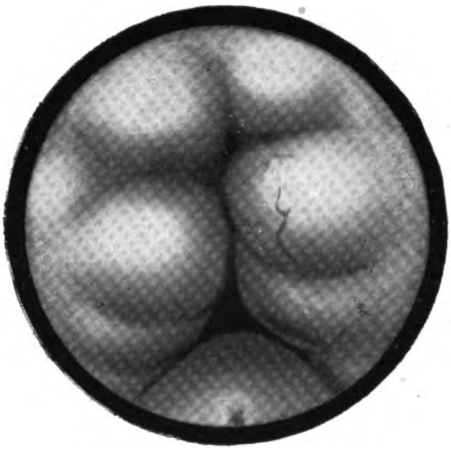

Fig. 68.—Urethroscopic lesions of the prostatic fossette, behind the verumontanum.

seen, they appear red, swollen, and surmounted with overhanging margins.

Laterally, the ejaculatory orifices may be seen occasionally, more or less filled with pus. Thus in a case of left chronic epididymo-orchitis of gonococcal origin, I saw pus emanating from the left ejaculatory duct; above, was the verumontanum, very much congested and displaced considerably. The membranous region, congested and even cyanosed completely loses its luster; its folds become larger and more swollen and the mucosa projects into the urethroscopic tube like a hernia. It is quite customary to find the mucosa of the posterior urethra markedly swollen and manifesting itself in the form of bullous edema, concentrated more or less, and bleeding readily (Fig. 68).

The prostatic follicles are very often the seat of chronic inflammation; their orifices often appear red, swollen, and surrounded with a projecting and overhanging margin. Goldschmidt has justly compared

them to frog's eyes. At other times they appear like little purulent masses adjoining one another taking the form of little white buttons, often acuminated and simulating boils. It is well to note that this chronic inflammation of the prostatic follicles not only lies behind the verumontanum on the inferior urethral wall, but also on the anterior superior wall of the urethra, as is well shown in Figs. 68 and 69; it may likewise be observed in the lateral gutters or grooves situated on either side of the base of the verumontanum.

For this reason the examination of the posterior urethra with the simple straight tube seems to give results infinitely preferable to those obtained with instruments designed specially for the posterior urethra. With Goldschmidt's instrument, for example, the anterosuperior wall

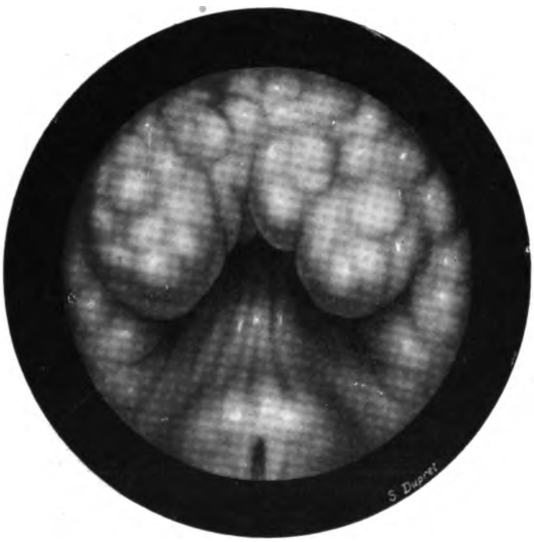

Fig. 69.—Glandular lesions of the anterior surface of the prostate, seen with the urethroscope.

of the prostatic urethra can not be examined without great difficulty; in using this instrument, therefore, distinct lesions of the posterior urethra might be entirely overlooked.

The following report of a case of chronic posterior urethritis, with gonococci in the prostatic focus, is of particular interest in this connection:

A man, forty-four years of age, referred to me by Portalier, had an attack of gonorrhea ten years previously which was treated simply with irrigations of permanganate. For ten years he had not noticed any appreciable discharge. Suddenly on May 6, 1910, the patient developed a profuse discharge containing typical gonococci. Greatly astonished by the appearance of the discharge, he at once suspected his mistress and requested me to examine her. On two different occasions the most careful examination of the young woman was made, and notwithstanding the greatest care, I could not discover any possible infected focus which might

harbor gonococci. The examinations included a urethroscopic examination of the urethra, examination of the paraurethral glands, Bartholin's glands, the posterior vaginal cul-de-sac, and the cervical neck, which was scraped with a platinum loop. The rectum was also examined and found entirely normal. In a word, the young woman seemed absolutely healthy and free from all gonococcal infection.

The problem was to discover the origin of this mysterious infection. After some days of irrigation with permanganate, the discharge disappeared gradually and dried up completely. The urine, at first turbid, slowly cleared up to such an extent that a urethroscopic examination could safely be undertaken on May 27, twenty-one days later. To my great surprise, I found that the canal was perfectly normal behind the verumontanum up to the vesical neck; but at the verumontanum and in front of it there were well-marked lesions of soft infiltration. At this point, examination showed bullous edema, little polypi and polypoid forms in great abundance, together with an edematous thickening of the mucosa. The bulb and the penile urethra were apparently perfectly normal. It appeared then as if this was a manifestation of a very old chronic posterior urethritis which had permitted the gonococci to remain latent for a period of ten years and which suddenly reappeared at the end of that period.

Gross dilatation of the urethra, at first with Béniqué sounds then with Franck's three armed dilator soon resulted in a complete cure of the patient. Urethroscopic control was instituted after the application of Franck's dilator, and gave positive proof of the complete disappearance of all the lesions.

Another instance of the same kind is also quite characteristic:

A man of forty-five showed a discharge containing gonococci for six months. He had been treated by Wormser with urethrovesical irrigations of permanganate followed by gradual and methodical dilatation of the urethra with curved sounds up to No. 56. At the same time he had had an acute inflammation of Tyson's gland which was incised externally and completely disinfected. In spite of this scientific and methodical treatment, the patient showed a recurrence of the discharge with gonococci as soon as the irrigations were suspended for a short time. It was therefore believed that there existed somewhere a permanent gonococcal focus.

To discover the location of this focus, Wormser sent the patient to me on June 6, 1910. Examination of the urethra stretched over a straight Béniqué sound gave evidence of the presence of enlarged Littré glands; the prostate presented only minor changes; Cowper's glands and the seminal vesicles were apparently normal; the epididymes showed no evidence of a previous inflammation.

Urethroscopy showed a normal anterior urethra, but the posterior canal revealed a number of well-defined lesions. These consisted of little white vesicles very well marked, which lay just above the verumontanum. When they were touched with a cotton swab they did not become detached and the swab slipped over them without their being ruptured. In view of these findings, I recommended that Wormser continue the treatment which he had so well begun and maintained, and continue the dilatation still further. The patient was then dilated up to No. 60 Béniqué.

Four days later, however, the irrigations having been temporarily suspended, the discharge reappeared and was again found to contain gonococci. I examined him again urethroscopically on July 1, 1910, and was able to note that the lesions which I had observed near the verumontanum were still present and had not been changed at all. This latest recurrence was then easy to account for. In agreement with Wormser I began dilatation with Franck's dilator, pushing it to its extreme limit, this being attained on July 13, 1910.

Following this treatment, the patient having gone six days without a permanganate irrigation, or any other treatment, he wrote me that his condition at the time was quite satisfactory, that there was no relapse of the discharge and that his urine was clear. The dilatation had seemed to produce the desired effect, and the focus which had harbored the

PLATE V

FIG. 1.—*Curious pathologic aspect of the verumontanum.* The prostatic utricle instead of being placed on the anterior surface of the verumontanum is detached and thus forms a distinct pocket. This case, observed in a man thirty-one years of age, referred to me by Gaston Alexandre, is especially interesting by reason of the sterility which was the inevitable consequence of this pathologic condition. This patient, who was anxious to have children, found it impossible to procreate; for at the moment of ejaculation the semen accumulated in the pocket of the prostatic utricle and could not be projected forward, the seminal fluid oozing out some minutes later through the urethra.

FIG. 2.—*Pathologic aspect of a chronic inflammation of the verumontanum in a case of chronic spermatocystitis.*

FIG. 3.—*Unusual appearance of the ejaculatory ducts.* This was a case in which chronic relapses of gonococcal urethritis were suppressed only by cauterization of the verumontanum. This had to be destroyed by the actual cautery, thus leaving the ejaculatory ducts exposed like two gun barrels lashed together.

Fig. 1.

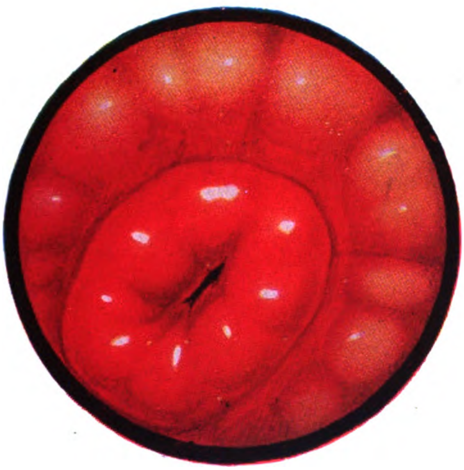

Fig. 2.

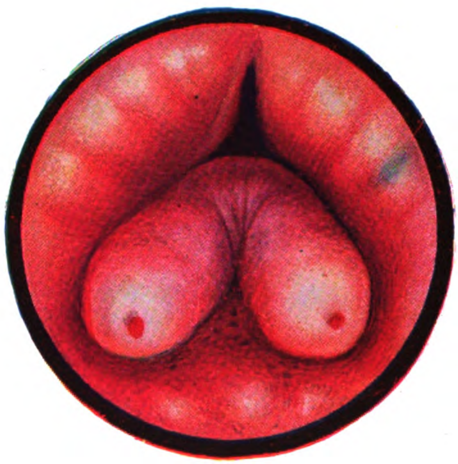

Fig. 3.

PLATE V

gonococci for such a long period had apparently been destroyed completely. As a confirmation of this perfect cure of the patient, I saw him again on July 25, 1910. Having gone for a fortnight without any treatment, he declared with great pleasure that there was no discharge and his urine was clear without the slightest trace of filaments or shreds.

With the urethroscope I noticed that there no longer existed any evidence of a purulent cyst or a pathologic focus in the posterior urethra that might act as a nidus for the gonococcus. The verumontanum still showed the presence of a slight chronic inflammation, this being made evident by a distinct edematous appearance. I cauterized the summit and painted the entire body of the verumontanum lightly with tincture of iodin. From that time on, the cure was complete and the gonococci never returned.

Desvignes, of Limoges, has published[2] the following interesting report on this subject:

"On Dec. 28, 1910, B., aged thirty-four years, presented himself for consultation to our chief, Luys, complaining of a morning drop. He had contracted gonorrhea a year previously and had been treated with irrigations of permanganate and oxycyanide of mercury. A series of local applications of silver nitrate had been made and large Béniqué sounds up to No. 60 had been passed.

"The urine presented large heavy shreds in the first glass and the fourth glass was clear. Microscopic examination of the morning drop revealed the presence of numerous leucocytes with a few diplococci which did not resemble the gonococcus. The meatus was normal; the foreskin free, no paraurethral fistula. Per rectum, the prostate and seminal vesicles were negative; likewise the massaged expression of these glands; Cowper's glands also negative.

"Luys then decided to apply urethroscopy, using his instrument with tube No. 60. In the posterior urethra, he noted the following: At the upper part of the prostatic fossette, three large edematous and whitish projections indicative of a chronic prostatitis, constituting a hernia into the urethroscopic tube. The entire mucosa of the posterior urethra was uniformly red. In the anterior urethra he noted a slight hardening of the bulbous region; a few Littré's glands were situated on the upper wall.

"The anterior urethra was dilated with a straight Kollmann dilator up to No. 90; then dilatation of the posterior urethra with a curved Kollmann was alternated with massage of the prostate.

"April 6: The patient had no morning drop but still showed some filaments in the first glass of urine. Urethroscopy: The minor lesions of the anterior urethra had disappeared, and the appearance of the posterior urethra had changed considerably. It was much less inflamed and in place of the large edematous circumscribed projections in the prostatic fossette three whitish vesicles which seemed purulent in character, were observed. These vesicles were cauterized.

"Ten days later cauterization was repeated. The patient reported feeling much better and presented nothing but a few thin floating filaments in the first urine. All treatment was now suspended. The patient was seen again early in June, 1911, and had no filaments whatever in the urine.

"In conclusion, this report indicates clearly that through urethroscopy alone was a correct diagnosis and appropriate treatment made possible in this case, which had resisted all other therapeutic methods at our command."

The study of the prostatic fossette is extremely interesting in chronic prostatitis. It is well to remember, in this connection, that the orifices of the infected follicles open on the floor of the fossette. Looking at this region through the urethroscope while the prostatic lobes are massaged with one finger in the rectum, streams of pus may be seen gushing forth from the infected glands. The glandular orifices

from which pus is most frequently evacuated are found on the lateral margins of the verumontanum on a level with its base.

In two cases of chronic prostatitis which were apparently absolutely incurable, I have been able to observe that pus exuded from several gland orifices on the side of the verumontanum when pressure was exerted on the prostate through the rectum. In these two cases, I succeeded in greatly enlarging these orifices, which had caused retention of the pus because they were too narrow.

In a man thirty-four years of age, the orifice was enlarged with a galvanocautery point and behind it we found a real "prostatic cavern" (Plate VI, Fig. 1). This was subsequently easily disinfected with swabs of cotton steeped in silver nitrate or resorcin. In both cases I was specially struck with the enormous dimensions of these prostatic caverns. With the original orifice so narrow, the great size of these caverns is not usually suspected. It is, therefore, evident that these urethroscopic researches are of the greatest importance, for it is only by their aid that we are able to find the solution of the problem so often placed before us; namely, the cure of these old and seemingly incurable cases of prostatitis.

Localization of chronic urethritis in the posterior urethra is extremely common, notwithstanding the general belief to the contrary. It is true that in an acute inflammation, it is impossible to make urethroscopic observations because of the hyperemic condition of the mucosa; in the chronic stage, however, when the entire posterior urethra can be examined deliberately and carefully, the reason for the existence of otherwise inexplicable symptoms will usually be revealed.

The posterior urethra is seriously altered in hard infiltration; the membranous region takes on a grayish red, slightly yellowish color, its brilliant luster disappears and gives place to a dry and dull appearance. The epithelium desquamates freely so that it may be denuded over a very considerable extent; it is this more or less complete desquamation that is responsible for the bleeding which is so easily produced by the introduction of the urethroscope.

The mucous folds which are normally so numerous in the membranous region, disappear almost completely under the influence of fibrous infiltration. When this is very much pronounced, it is no longer possible to see anything except a rigid tube of yellowish or pearl white color. When the latter tint predominates, it is an indication of the presence of pachydermia of the mucosa.

Vegetations and polypi are frequently situated either on the verumontanum or in some portion of the posterior urethra. Not infrequently their existence coincides with neurasthenic phenomena of an

extremely marked type. Sometimes they are on the verumontanum itself (Fig. 70). In this particular case, it appeared in the form of a cock's comb and it was not at all difficult to cause its disappearance

Fig. 70.—Polypus on the summit of the verumontanum.

with the galvanocautery point. In other cases, they take on the appearance of long polypi resembling eels (Fig. 71). They may then

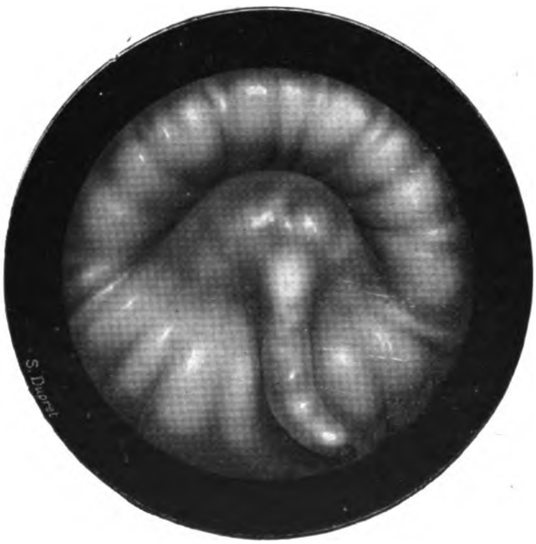

Fig. 71.—Long eel-shaped polypus on the anterior aspect of the verumontanum.

assume the most fantastic forms according to the way they are made to move in one direction or another under the influence of the presence of the urethroscope. [This is beautifully shown in the modern water-

dilating urethroscopes. The current of water striking the long, slender polypus, carries it along in the direction of the bladder, and when the flow of water is stopped, it returns to its normal position. Intermittently making and breaking the flow of water gives an unusually striking picture.—EDITOR.] The phallus-shaped polypus shown in Fig. 72, gives a good idea of the form they can assume.

Occasionally they lie in the membranous region, or they are pedunculated, with a long stem. Or they may take on a cauliflower appearance invading almost the entire posterior urethra and covering the verumontanum completely. These cases are the most difficult to treat because of the extensive cauterization which they necessitate, at the same time taking precautions to preserve the ejaculatory ducts intact.

Fig. 72.—Long phallus-shaped polyp on the superior aspect of the verumontanum.

I have had the opportunity to observe a similar case in a young man of thirty-five, who presented frequent gonococcal relapses. The center of infection was in the posterior urethra which was completely invaded with raspberry-like vegetations. Notwithstanding systematic dilatations of the posterior urethra with Franck's dilator up to No. 45, relapses still continued to occur. Urethroscopic treatment was then applied. It consisted of applications of the actual cautery to the entire posterior urethra; these cauterizations could not be made without directly attacking and destroying the verumontanum, thus leaving the ejaculatory ducts exposed. This is well shown in Plate V, Fig. 3. The verumontanum no longer exists and the ejaculatory ducts look like two gun barrels fastened to each other.

The orifice of the prostatic utricle is often widely dilated and the seminal fluid may be seen exuding from its lumen. In certain cases when it is necessary to establish the differential diagnosis between prostatic and vesicular secretion, urethroscopy may be combined with massage of the prostate, to great advantage. By this means, seminal fluid can be made to exude from the prostatic utricle and the prostatic ducts under the observer's eye; in this way, extremely useful data may be revealed which will often indicate the most suitable and effective therapy.

Occasionally the prostatic utricle is shifted to one side or another of the verumontanum instead of occupying the median line; and in cases of chronic epididymitis it is not unusual to observe a purulent secretion emanating from the prostatic utricle. Again, the lips of the utricle may be congested and verrucous, and will bleed at the slightest irritation; this condition explains one of the symptoms of which patients with chronic posterior urethritis often complain; namely, blood-stained seminal ejaculations.

When the verumontanum has been invaded by fibrous tissue, it becomes yellowish in color and appears as if it were dried up and rumpled. In these cases, the orifice of the prostatic utricle and the ejaculatory ducts may be contracted or entirely choked up. These lesions account for the sharp pain at the moment of ejaculation, which is so pathognomonic of certain cases of chronic prostatitis. In other instances, we encounter simple hypertrophy of the verumontanum, which is usually associated with the habit of masturbation. For a view of the "masturbator's verumontanum" see Fig. 73. This picture is so true that I have very often been able to accuse certain patients of masturbation who confessed the practice of this habit only when confronted with the existing lesion. In these cases there is a considerable hypertrophy of the verumontanum which gives it an appearance resembling the uterine neck involved in metritis. The utricle becomes wide and gaping, and takes on the aspect of the mouth of a tench. The verumontanum and the ejaculatory ducts may undergo other and more varied changes; these are studied in detail further on (see Catheterization of the Ejaculatory Ducts, page 115).

Posterior urethroscopy is also extremely useful and interesting in prostatic hypertrophy. In this condition, most exact information can be derived concerning the length of the prostatic tunnel, of the shape of its walls and of all its sinuosities; also of all the abnormal protuberances that may be encountered; the latter being responsible for the urinary difficulties that the patient complains of.

It can also be seen how it is possible to destroy these projections,

which prevent normal micturition, under control of the eye. Its therapeutic value in these conditions can also be appreciated. Let it be understood, of course, that one can not dream of supplanting transvesical prostatectomy in this manner; but it is nevertheless true that this method can be of distinct service in many cases. Undoubtedly it is far

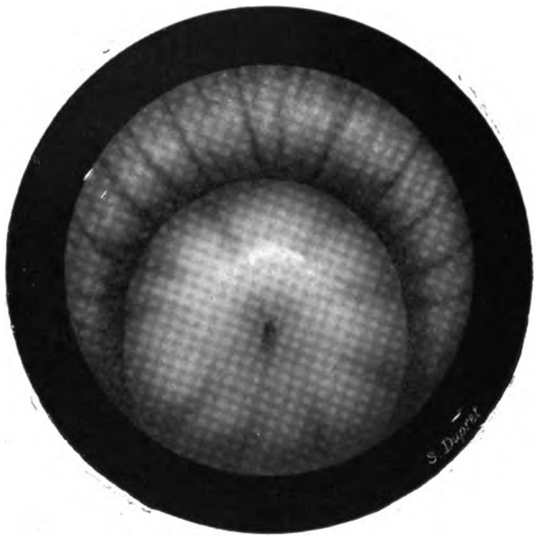

Fig. 73.—Hypertrophied verumontanum, the result of a chronic inflammation. The organ resembles the uterine neck. (Masturbator's verumontanum.)

superior to the blind section employed in the Bottini method, since it permits the cauterization of the exuberant portions of the prostate to be done directly under the control of the eye (see Urethroscopic Treatment of Prostatic Hypertrophy, page 135).

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Urethroscopy in the Female

Urethroscopy in the female is just as necessary as it is in the male. It goes without saying that this examination shall not be made in either sex without the urethra having been sufficiently dilated previously. In the female, a short urethroscopic tube should be used; this has already been described (see page 43).

However, as there are numerous instances in which the vesical

neck in the female also participates in chronic inflammation of the urethra, it is often advisable to examine the bladder neck and the deeper portion of the urethra at the same time. But when the simple urethroscopic tube enters the bladder the presence of the urine prevents a clear view of the lesions existing at the vesical neck; consequently a special instrument is necessary and I recommend for this purpose the female model of my direct vision cystoscope.

Whether we employ the simple tube or the direct vision cystoscope, the entire urethra must be examined from the neck of the bladder to the urinary meatus. During the passage of the instrument from behind forward, toward the meatus, it will be possible to study carefully all the peculiarities of the mucosa,—the little polypi, the papillomata, and the orifices of the urethral glands.

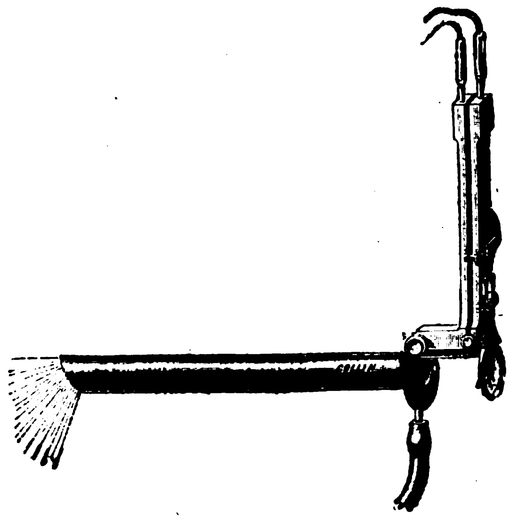

Fig. 74.—Luys' direct vision cystoscope, female model, complete.

The vesical neck of the female deserves quite special attention. It should be examined with the direct vision cystoscope, both on its vesical side as well as on its urethral aspect. Important lesions may thus be found of which we might otherwise remain in complete ignorance, and the disorders which they give rise to would continue indefinitely with their causes undiscovered.

At times, we find well-developed polypi, such as are shown in Plate XVII. In this particular case, the patient was referred to me with the diagnosis of bladder tumor. Though her urine contained blood, cystoscopy demonstrated positively that she had no tumor in the bladder. However, she did have several small polypi at the vesical neck, which clearly explained the bloody urine.

These polypi may exist only in rude outline. In Plate XX., Fig. 1, the cervical mucosa can be seen extremely congested with projecting areas of congestive edema, which seemed as if it would eventually end in the production of polypi.

Occasionally real abscesses, not very large, can also be seen at the vesical neck; these abscesses may be the cause of the repeated urethral reinfections so often encountered. In Plate XX., Fig. 2, a rather large abscess can be observed situated on the urethral aspect

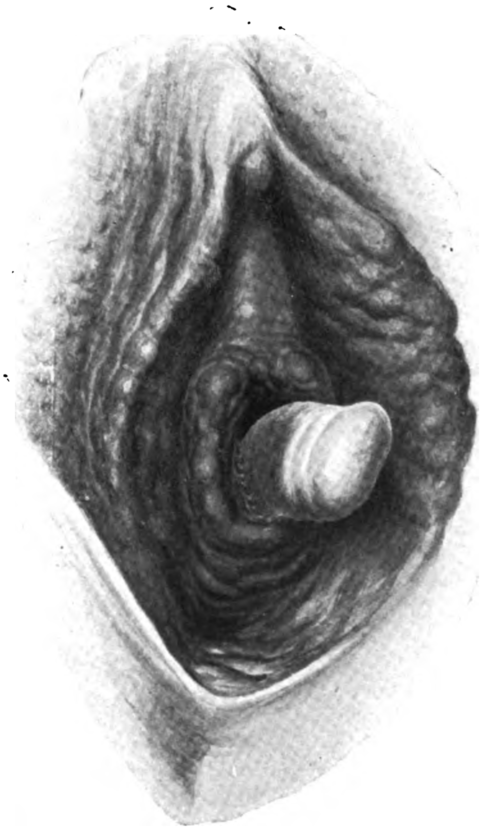

Fig. 75.—Large pediculated polypus in the female urethra, implanted on the floor of the urethra.

of the vesical neck. The young woman who had this lesion suffered from continued relapsing attacks of urethritis which could not be explained by the appearance of the anterior part of her urethra. This abscess, which had resisted urethral dilatation, was opened by means of the galvanocautery. The cautery point first ruptured the abscess wall; this brought forth a flow of pus and then completely destroyed the entire purulent pocket and resulted in a complete cure of the patient.

In the female urethra, two quite distinct anatomic parts should be

distinguished: First, the posterior portion which adjoins the neck of the bladder and is entirely muscular in structure. In this portion urethroscopy shows the presence of abundant muscle fibers which are indicated by the presence of regular, well-marked radiations. This part of the urethra is less frequently attacked by inflammatory processes, for it is almost devoid of glands. Secondly, the anterior portion of the urethra is very different from the posterior portion because of the abundance of glandular orifices. These glands are constant and constitute two important lateral groups. Anatomically, they are mucous glands and they open on the surface of the urethra by means of rather well-developed orifices, which can be seen plainly with the urethroscope. These glandular orifices strongly simulate the glands in the male penile urethra in appearance and structure, being homologous with the glands of Littré and the lacunæ of Morgagni. Like the latter they are liable to gonorrheal inflammation with all its consequences. The existence of these glands is probably responsible for the tendency of the gonococcal infection to persist in the female urethra; they may also account for the frequent development of polypi at the external orifice of the urethra (Fig. 75).

The logical conclusion to be drawn from these data is that the most satisfactory treatment of chronic gonorrheal urethritis in the female is identically the same as that in the male; namely, dilatation.

The necessity of urethroscopy in the female forces itself upon us, for this method of examination alone permits us to make the most surprising diagnoses, which would otherwise be absolutely impossible.

The following report will illustrate this more fully:

A woman, forty-four years of age, was referred to me on June 5, 1905, by Terrier. She said she had been operated upon five years previously, for a tumor of the bladder; the urine was clear and there was no increased frequency, but she suffered intense pain during and after the act of urination.

In the belief that the vesical tumor had recurred, the patient had several times visited Albarran, who had operated on her, but he declared, after examination, that he found no lesion whatever in the bladder. Then she consulted Terrier, who sent her to me.

Clinically the bladder showed nothing abnormal; its capacity was over 300 c.c. The vesical wall was entirely normal and painless to the touch. Further examination with the prismatic (indirect) cystoscope proved that the organ was absolutely normal and that there was no recurrence of the tumor.

On June 23 I made another examination with my direct vision cystoscope, and I again noted that the bladder appeared normal. I was preparing to suspend the examination and was slowly withdrawing the instrument which was still in the urethral canal, when the lumen of the tube was suddenly and completely inundated with a muddy liquid which was apparently purulent. After this fluid was evacuated and the mucosa dried, I inspected the urethral wall. I found that there was an orifice on the right lateral wall, about two centimeters from the meatus, which led into a paraurethral cavity. Pressure exerted by the cystoscopic tube on this cavity, brought forth a muddy liquid accompanied by purulent clots. In

this case, we were undoubtedly dealing with a paraurethral abscess, which had been ruptured by the pressure of the cystoscopic tube.

Subsequently the bottom of the cavity was cauterized with a fine silver nitrate pencil and the paraurethral orifice enlarged with a thin galvanocautery point so as to provide better drainage. Under the influence of this treatment, the patient's pains ceased and disappeared entirely.

The following is another illustration of the great importance of urethroscopy in the diagnosis of urethrocystic affections in the female:

A woman was referred to me in October, 1910, complaining of severe pain in the bladder and urethra both during and after micturition, for a period of seven months. The preliminary examinations were rendered very difficult owing to the extreme sensitiveness of the urethral canal; but with a little patience, systematic dilatation of the canal was accomplished, so that the urethra was sufficiently dilated by the end of November to enable me to introduce my direct vision cystoscope.

On November 22, I found that the entire bladder was perfectly normal; likewise the posterior portion of the urethra. But in withdrawing the tube slowly I noticed a little edematous orifice on the left lateral wall through which some drops of pus were exuding. Catheterization of this orifice with a fine wire was practically impossible. The lesion was undoubtedly a paraurethral fistula.

Later on, this orifice was enlarged by the galvanocautery, thus facilitating evacuation of the pus. A few days after this treatment, the patient passed large masses of purulent clots, which, on analysis by Hallion, consisted of pus, and numerous ill-defined bacterial forms; the gonococcus and Koch's bacillus were not found.

CHAPTER III

PRACTICAL APPLICATIONS OF URETHROSCOPY

Urethroscopy is not limited in its usefulness to the examination of the urethral mucosa. Its field of application has become greatly extended so that it is today considered of the greatest value in the diagnosis of conditions involving the urethra and its adnexa, especially the prostate, seminal vesicles, and Littré's glands; it has likewise proved its great value in a surprisingly efficacious manner in the therapy of these organs, particularly of the seminal vesicles and the prostate.

We shall, therefore, take up in succession, first, catheterization of the ejaculatory ducts, and second, the endourethral treatment of prostatic hypertrophy.

CATHETERIZATION OF THE EJACULATORY DUCTS

When we consider the astonishing facility with which we catheterize the ureters today, thanks to the perfection in modern technic, it is surprising indeed that we have not made similar advances in the catheterization of the ejaculatory ducts; yet notwithstanding this failure, medical literature is practically silent on this subject.

In 1905 Klotz[1] made several attempts to catheterize the ducts. He devised a little special syringe provided with a fine cannula which he introduced into the orifice of the ducts hoping thereby to inject solutions into the seminal vesicles, but the results were not satisfactory, inasmuch as his injection was followed by epididymitis. This attempt of Klotz, however, marked a new era in this work; for it gave the first promise of a means of access toward the dark and mysterious sinuosities of the seminal vesicles. Undoubtedly the solution of this subject will be found in the further perfection of the technic of urethroscopy.

Belfield[2] also succeeded in catheterizing the ducts. But when he found the search for these orifices rather difficult especially in pathologic cases, he resorted to rather complicated expedients in order to make the orifices of the ejaculatory ducts more easily discernible. By means of a puncture in the vas deferens near the groin, he injected some milk with which he filled the corresponding seminal vesicle. Subsequently, by making pressure on the milk-filled vesicle through

the rectum, he was able to obtain a better view of the ejaculatory orifices and thus succeeded in catheterizing them. This method was not only complicated, but also not without its dangers.

However, it may be stated that catheterization of the ducts is not only possible, but absolutely demanded in certain cases.

Anatomic Considerations

If researches on the cadaver are to be taken as our guide in the study of catheterization of the ducts, we are apt to be disappointed in the results obtained. In the cadaver, the verumontanum and the ejaculatory canals are certainly much more difficult to locate than in the living subject. This is due to the fact that the verumontanum

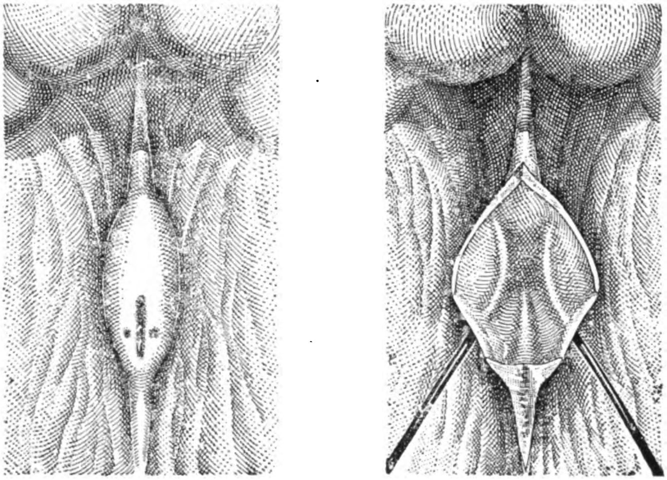

Fig. 76.—Classic arrangement of the ejaculatory canals, situated symmetrically on either side of the verumontanum.

being essentially an erectile organ, is normally very vascular and filled with blood, and in the cadaver is much reduced in size; consequently the duct orifices are much more difficult to find. This difficulty of catheterization in the cadaver is true of all body canals, and particularly so as regards the ejaculatory ducts.

The best way to recognize the ejaculatory ducts is to inject a little water into the lumen of the vas deferens; then on massage of the vesicle, the urethroscope *in situ,* we can see the fluid entering the urethral canal in the form of a fine jet, and this enables us to identify the corresponding duct and thereby note its exact position.

In cooperation with Pelletier, we instituted a series of urethroscopic experiments on the cadaver and on a living subject, to determine

the arrangement of the ejaculatory ducts in relation to the prostatic utricle and the verumontanum. The conclusions we arrived at differ considerably from the usual anatomic conception. In point of fact, authors usually describe the orifices as being situated most frequently

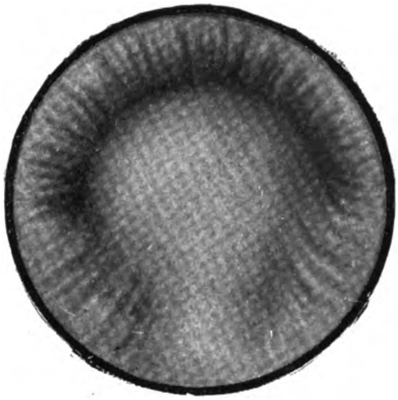

Fig. 77.—Verumontanum without any visible orifice.

on the sides of the verumontanum and symmetrical with the utricle. The verumontanum is then found to contain three openings: The prostatic utricle in the median line, and the ejaculatory orifices on either side (Fig. 76).

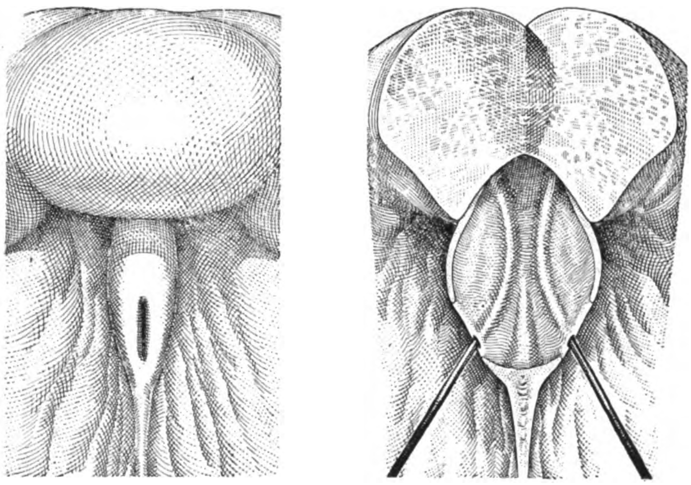

Fig. 78.—Ejaculatory canals opening on the lips of the prostatic utricle.

This clinical description is far from correct in the vast majority of cases. In eleven cadavers which we studied, this arrangement was met with only three times. In fact there are cases, rare it is true, in

which it is not possible to see any orifices at all, neither the prostatic utricle nor the duct orifices being visible. But these instances are almost always pathologic in character.

Fig. 79.—No prostatic utricle visible; the ejaculatory canals open on the lateral walls of the verumontanum, resembling a diver's helmet.

A second disposition of the orifices which is quite frequent, is that in which a median utricle is seen, and on its lips or edges are the orifices of the ducts (Fig. 78). This arrangement was noted seven times in

Fig. 80.—The ejaculatory canals open on the lateral walls of the verumontanum but at different levels.

our study of the cadaver. Still another arrangement is that in which there exists no median utricle, but the ejaculatory ducts open on the

lateral walls of the verumontanum (Fig. 79). This is the "diver's helmet" appearance, which I have already described.[3] In this type, the duct orifices are usually placed symmetrically on either side of the median line; there are instances, however, in which they are not on the same horizontal plane, but one lower than the other (Fig. 80).

Fig. 81.—Urethroscopic view in which the prostatic utricle is visible; the ejaculatory canals can not be seen.

The ejaculatory ducts may be altogether invisible in another type. The median utricle can be seen, however, and it is only when an incision is made above and below it, that the ducts will be found at the

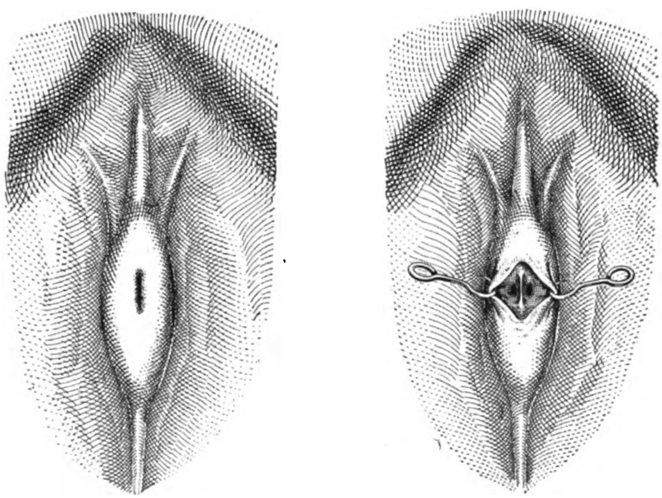

Fig. 82.—The ejaculatory canals were made visible only after incision of the utricle; they were found at the base of the utricle.

bottom of the utricle, lying close to one another like two gun barrels (Fig. 82). This arrangement was encountered but once in the eleven cadavers studied.

Lastly, there is the type, very rare indeed, in which the verumon-

tanum is destroyed through cauterization with silver nitrate or the galvanocautery. The walls of the organ disappear and below them nothing remains but the two ejaculatory canals, fastened together like gun barrels (Fig. 83). This occurs in cases in which the destruction of the verumontanum has been made necessary by the persistence of the gonococcus in the walls of the verumontanum.

In conclusion, we may say there are two principal types: In the most common type, the ejaculatory ducts open upon the lips of the utricle; the other is the classic type above referred to; namely, the median utricle and lateral orifices. All other types are anomalies, but it should be borne in mind that they are quite common, nevertheless.

It is interesting to note that a catheter introduced into the ejaculatory ducts will always pass into the seminal vesicle and never into the vas deferens. This observation is confirmed by our studies on the cadaver, and is of considerable importance since it is a useful aid in securing direct drainage of the seminal vesicles. It is, therefore, quite probable that the successful catheterization of the ejaculatory ducts will bring with it an effective means of drainage of the seminal vesicles.

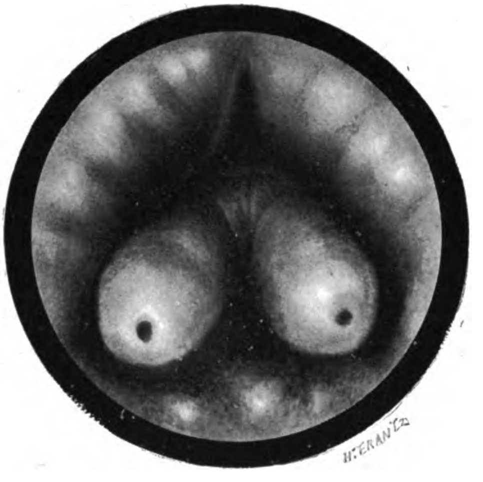

Fig. 83.—Gun-barrel aspect of the ejaculatory canals.

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[1]Klotz: New York Med. Jour., Jan. 26, 1895.
[2]Belfield: Catheterization of the Ejaculatory Ducts, Section on Genitourinary Diseases, Jour. Am. Med. Assn., 1912, p. 24.
[3]Luys: La Clinique, Feb. 14, 1913, No. 7, p. 98.

Indications for Catheterization of the Ejaculatory Ducts

Catheterization of the ejaculatory ducts is demanded whenever there are disturbances in the function of seminal ejaculation and generally speaking, in all cases of chronic spermatocystitis.

In point of fact, catheterization ought to be an indispensable feature in the treatment of spermatocystitis. In this condition the infected seminal vesicles have to be treated in the most thorough manner from one end to the other; that is to say, by massage of the body of the vesicle as well as by dilatation of its excretory duct. Dilatation is the indispensable complement of the massage, which empties and expresses the vesicular contents, while the dilatation facilitates and insures this desired effect.

It is well to remember the frequency of chronic spermatocystitis in gonorrhea, and on the other hand, the ease with which this pathologic condition remains latent for a very long period. These lesions are not only unknown to the patient, who feels no pain in or near the infected parts, but also to the physician whose attention is not sufficiently attracted to its possible existence. It is indeed extraordinary, that well-informed physicians who are familiar with the genitourinary organs so often examine the prostate but utterly neglect the seminal vesicles which are far more important.

The predominating factor favoring the localization of chronic infection in the seminal vesicles is the complete absence of all spontaneous pain and the paucity of symptoms. This focus of infection must be investigated thoroughly again and again; and in all cases of urethritis which exhibit a tendency to last too long, the best way to recognize this focus is by digital contact through the rectum. But this is so often rendered difficult by reason of the inaccessible situation of the vesicles and the stoutness of the patient, that it is necessary to place the patient in special positions in order to examine the seminal vesicles properly. These little organs are encountered by the examining finger in the rectum when it has passed above and beyond the lateral lobes of the prostate. But an inexperienced observer may very readily pass by a diseased vesicle without recognizing it.

There are four principal diagnostic signs by which we may know whether the seminal vesicle is diseased or healthy, as follows:

1. *Pain.* An infected seminal vesicle is always painful or tender to the touch; this sensation of pain must be compared with the opposite side to bring it out more fully. Sometimes it is severe enough to cause syncope, and it may develop an immediate lypothymia.

2. *Induration* of the walls of the seminal vesicle.

PLATE VI

FIG. 1.—*Prostatic cavern observed in chronic prostatitis.* To the left of the picture the left margin of the verumontanum will be noted. Adjacent to the verumontanum is the comparatively large mouth of the prostatic cavern. Some urine always accumulated in this pocket. This cavern always gave forth a purulent, urethral discharge. It was only through a widening of the mouth made by the galvanocautery and a complete cleansing with tincture of iodin that the cavity was disinfected.

FIG. 2.—*Urethroscopic view of a urethral stricture.* The mucosa has a cardboard-like appearance. The urethral walls are invaded by fibrous tissue; they have no elasticity and can not approximate each other at the central lumen. They resemble a funnel of rather pronounced type. Littré's glands, chronically inflamed, are seen in profile on the fibrous urethral walls; one can also notice the bleeding clefts or cracks on the wall which are the results of dilatation, this having the same effect on the fibrous mucosa as so many little internal urethrotomies.

Fig. 1.

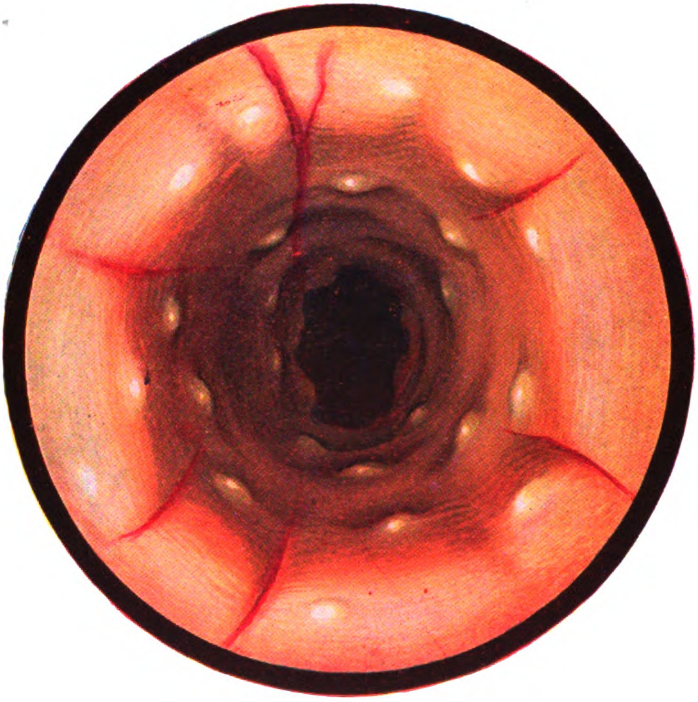

Fig. 2.

PLATE VI

3. *Vesicular expression* brings forth rather large, ribbon shaped vesicular casts (Fig. 85).

4. *Sensitiveness or pain* in the region of the verumontanum, which is determined by the aid of the olivary bougie. When this pain is

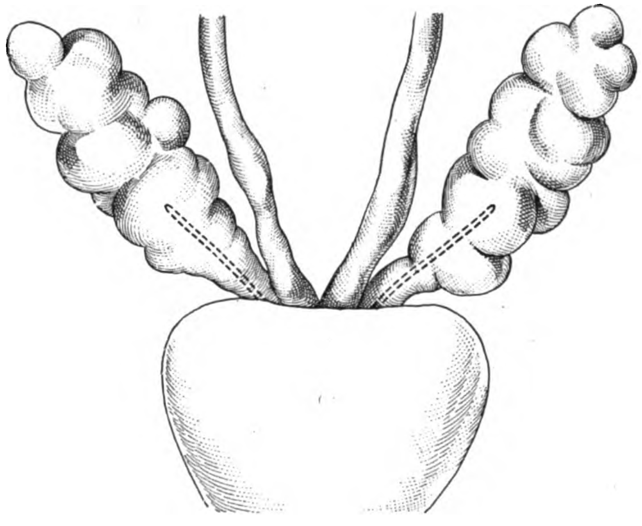

Fig. 84.—A stylet introduced into the orifice of the ejaculatory canals, enters the seminal vesicles, and not the vas deferens.

encountered, it is the indication of a chronic painful inflammation of the verumontanum and not of a peculiar nervous or neurasthenic condition as was formerly too often believed to be the case. This little

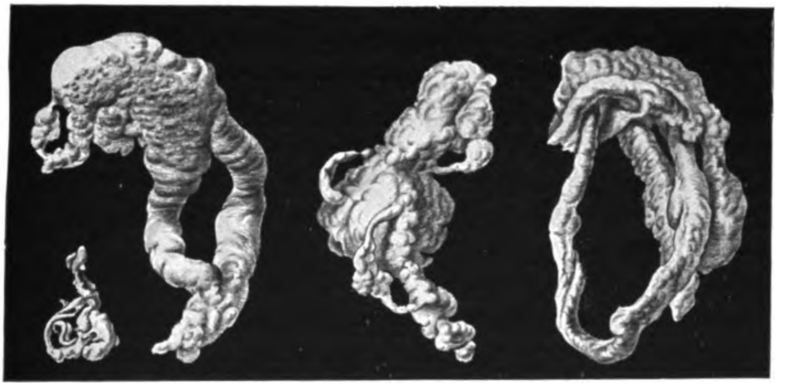

Fig. 85.—"Vesicular casts," obtained by massage of the seminal vesicles (drawn from nature).

organ, which is situated at the mouth of the ejaculatory ducts, undergoes inflammation by the very reason of its location, and its pathologic involvement is almost always in direct relationship with the coexisting

inflammation of the seminal vesicles. This tenderness to the touch might very properly be termed the "urethrovesicular reflex."

Apart from these distinct symptoms which make the diagnosis fairly certain, there is a series of symptoms which must also attract attention. These are the following:

1. The urine may be turbid or clear, with shreds in the first glass, or phosphatic.

2. Urinary disorders, such as dysuria or pollakiuria; both of which may sometimes be confused with cystitis.

3. Spontaneous pains but always indefinite and vague, referred to the perineum, testicles, kidneys, or thighs.

4. Reflex pains far removed from the seat of the lesion, such as sciatic neuralgias, or renal pseudocolic.

5. Genital disturbances characterized by painful ejaculation, or symptoms of sexual weakness or impotence, or finally, by an abnormal yellowish or bloody discoloration of the seminal fluid.

6. Recurrent epididymitis.

7. Most important of all, indefinite disturbances, consisting of general asthenia and complete body fatigue. This condition of fatigue disappears quickly under the influence of treatment for spermatocystitis and patients soon recover their general health, strength, and energy; the body weight is also improved measurably.

These patients suffer for many years from a sensation of heaviness in the hypogastrium, dull pains in the perineum, in the lumbar region or the thighs, as well as from scalding on urination; they also complain of a considerable decrease in sexual virility as well as ejaculatory disturbances. They have a slight urethral oozing every morning and shreds in the first glass of urine. Usually they have consulted a considerable number of physicians, surgeons, and specialists, and the result of these consultations has always been the same. "You are a neurasthenic—a nervous person," they say to the patient, adding that there is nothing the matter with him and advise him to pay no further attention to his troubles, and that they will disappear of their own accord in due course of time.

The result of these persistent disorders is that the unfortunate patient is soon brought under the influence of a permanent and irrepressible obsession with the fixed idea that he is incurable, that he will never be well again, that he may never marry, and that his life is ruined forever.

These chronic lesions terminate in a pitiable neurasthenic condition which keeps the victim always preoccupied making life impossible and sometimes ending with suicide. It has been my fate to have been pres-

ent twice in the role of a helpless spectator at a catastrophe of this kind. It is absolutely necessary that the medical profession should have its attention aroused on these matters. Unfortunately, too often the unhappy patient presenting these symptoms is treated as nervous and neurasthenic, whereas it would be a really simple matter to make a methodical examination of the posterior urethra, discover the lesions and give them appropriate treatment.

S. Jorge de Gouvea, of Rio de Janeiro has reported[1] the following interesting case of sexual neurasthenia cured by endoscopy:

"Sexual neurasthenia in the male often has its starting point in a pathologic condition of the posterior urethra. These chronic lesions, almost all of gonorrheal origin, are usually localized in the verumontanum which we know enjoys an abundant nerve supply. We can therefore readily understand how it happens that a pathologic process which gradually brings about such extensive anatomic changes, is able to produce so many local nervous disturbances which react on the general condition of the patient.

"Whenever in a neurasthenic, disturbances pointing to the urogenital system become manifest, it is absolutely necessary to have recourse to the modern methods of examination of the urinary apparatus. Endoscopy enables us to determine exactly the seat of the lesion which is giving rise to these general disturbances; likewise we are enabled to treat the lesion in a rational manner under control of the eye, thus bringing about a cure, not only of the local lesion, but also an amelioration and even a complete cure of the constitutional disturbances.

"This is what I have been able to report in the following case in which the Luys' urethroscope enabled me to determine the cure of a series of disorders which caused my patient to lead a life that was practically unbearable. As soon as the diagnosis was made, a complete cure was readily obtained, as will be seen from the following history:

"M. F., a soldier, forty years of age, consulted me on July 20, 1910. He had his first gonorrhea eight years previously and had treated himself with injections of nitrate of silver and sulphate of zinc. He was left with a morning drop which almost disappeared when he irrigated the urethra with permanganate, but which became aggravated whenever he committed an excess of any kind.

"At the time of the examination, he is forced to urinate frequently, small quantities being passed each time. During the act he experiences discomfort and a sensation of heat which extends through the urethra and the perineum. At the end of urination he has violent erections. Nocturnal pollutions are rather frequent and the emissions in coitus are premature and painful. He has lost weight recently, is very nervous, hypochondriac and discouraged; digestion is poor, and he always has vague lumbar pains. The urine is clear with filaments in the three glasses.

"With the bladder filled with a solution of oxycyanide of mercury, I examined his urethra. At the base of the penile region, I found a sensitive stricture made evident by a No. 12 olivary bougie. The posterior urethra was also distinctly tender. The kidneys apparently negative, chronic prostatitis, painful seminal vesicles, Cowper's glands negative.

"For fifteen days I irrigated him urethro-vesically, with permanganate and oxycyanide solutions. This was followed by internal urethrotomy with Kollmann's urethrotome; no retention sound. At the end of four days I began progressive dilatation of the anterior urethra with straight metallic sounds up to No. 50. When I tried a No. 51, it passed easily, but on reaching the posterior urethra, it produced a sharp pain and gave rise to slight bleeding. Some days later I continued the dilatation after local anesthesia with novocaine and adrenalin. The dilatation was slowly increased until No. 55 was reached, and then I introduced a Luys' urethroscopic tube No. 55.

"Examination of the posterior urethra showed that the cause of his illness lay in the

verumontanum, which was swollen and covered with many small raspberry-like growths on its surface; its base was free. With a fine galvanocautery point, I destroyed these vegetations and cauterized the surface with tincture of iodin; the operation was repeated a week later. During the succeeding month, I instituted a series of prostatic massages and deep instillations of silver nitrate, and the patient began to show signs of distinct improvement. I continued the massage and the endoscopy, cauterizing the verumontanum with iodin at each sitting.

"At the end of three months the patient urinated freely, and did not complain any longer of the sensations which he formerly experienced. The improvement was fully confirmed with the urethroscope. He no longer had his morning drop, his urine was normal and he passed it with normal frequency. I saw him again six months later and his general condition was excellent. Undoubtedly the cure was permanent."

REFERENCE

[1]De Gouvea: La Clinique, July 19, 1912, No. 29, p. 459.

Treatment of Spermatocystitis

The operative treatment of spermatocystitis has been studied chiefly by the Americans. The operations that have been proposed are the following:

1. **Vesiculotomy (Drainage of the Vesicle)** proposed by Fuller, of New York. The patient is placed in the genupectoral position and a curved incision is made in front of the rectum. To avoid injuring the latter, Fuller introduces the index finger of the left hand in the rectum, then with the index finger of the right hand introduced into the wound made by a somewhat careful dissection, he searches for the space situated between the rectum, prostate and seminal vesicles. The vesicle having been located with the finger, he plunges a grooved director into it and on this he introduces a bistoury. [The vesicle is then drained for several days with a rubber tube.—EDITOR.] This operation is evidently done blindly and does not conform to the standards of contemporaneous surgery.

2. **Vesiculectomy (Excision of the Vesicle),** which may be done either by the inguinal, perineal, or the ischiorectal routes. This operation is very difficult and involves considerable mutilation and risk. It is undoubtedly unsuitable in the vast majority of cases.

3. **Vasotomy (Vasopuncture),** proposed by Belfield, of Chicago. He exposes the vas deferens near the inguinal canal, then introduces a fine silver cannula into the vas, through which he injects a solution of either argyrol, protargol, or collargol. In this way he maintains that he succeeds in flooding the seminal vesicle with the solution; he injects daily for several days, then removes the cannula and closes the incision.

These surgical procedures seem, in most cases, altogether out of

proportion to the relative mildness of the disease, so much so that they should not be resorted to except in the most serious and desperate cases. In the vast majority of cases, the treatment of spermatocystitis should consist of the following: Massage of the seminal vesicles, local treatment of the verumontanum and catheterization of the prostatic utricle and of the ejaculatory ducts.

Massage of the seminal vesicles is difficult and takes time, and must be repeated frequently for a long period of time. It should be remembered, in this connection, that many physicians do not usually succeed in massaging the vesicles properly, but limit themselves to the prostate or the lower extremity of the vesicle.[1] To massage or strip the vesicle properly the top of the vesicular cul-de-sac must be reached and stripped with the finger from above downward. Unless this is done, massage of the vesicle is practically useless.

On the other hand, though this treatment is highly effective when properly done, so far as the affected vesicle is concerned, it is insufficient, inasmuch as it is absolutely essential to treat the other extremity of the vesicle also, that is, the ejaculatory duct adjacent to the verumontanum.

Local treatment of the vermontanum should be carried on under the control of the eye with the aid of the urethroscope. Unfortunately at the present time this is quite generally ignored. The affected verumontanum is treated at frequent intervals. Above all, it is necessary to begin by diminishing the inflammation of the verumontanum by means of copious urethrovesical irrigations and dilatation of the posterior urethra by means of curved sounds. And when dilatation has been carried far enough, so that a fairly large urethroscopic tube can be introduced without undue difficulty, local treatment of the verumontanum should be begun. It should consist primarily in caustic applications to the surface of the verumontanum.

These direct applications are not usually painful and never produce that tenesmus which is so disagreeable in the case of strong injections; whereas on the other hand, they produce the most desirable and happy results. Under their influence the verumontanum rids itself of all the pathologic products which disfigure it, such as polyposis, edema, and ecchymoses. At the end of a certain period of treatment, the result is a perfectly smooth and regular verumontanum with its principal characteristics clearly defined and outlined.

When this stage in the improvement has been attained, it is desirable to explore carefully the prostatic utricle and the ejaculatory canals. Catheterization of these canals is necessary in the majority of instances, absolutely indispensable in many. The need of catheteriza-

tion is due to the fact that these ducts very often undergo the same pathologic changes as the urethra in general, and there is no reason why the duct walls should escape the same fibrous alterations that take place in the rest of the urethral canal.

Since strictures of the urethra, which are the result of gonorrhea, are more or less frequent, strictures of the ejaculatory ducts must likewise be frequent; and these strictures must necessarily exert considerable influence on the perpetuation of chronic spermatocystitis. In point of fact, because of the inflammation of its walls, the seminal vesicle is filled with pathologic products which appear in the form of "casts." Now, these vesicular casts have a certain volume which makes it impossible for them to pass through an ejaculatory duct, the lumen of which has been narrowed by a stricture.

Thus the evacuation of these gross pathologic products can not take place during the seminal ejaculation. This explains the fact observed in many instances, that during or after massage of the affected vesicle a sharp pain is often experienced, even perhaps an acute orchitis; in these cases, there is no evacuation of the pathologic products as the result of the massage. It is in these conditions that catheterization of the ejaculatory ducts is necessary and even indispensable.[2]

REFERENCES

[1]For full details, see Luys' Traité de Blenorragie, Paris, O. Doin, ed. 2, p. 308.
[2]Le Cathétérisme des Canaux éjaculateurs, La Clinique, Feb. 14, 1913, No. 7, p. 98.

Contraindications and Accidents Incident to Catheterization of the Ejaculatory Ducts

The existence of an acute inflammation of the urethra or of the seminal vesicles constitutes the most general contraindication to catheterization of these ducts. The urethra must first be completely cleared up before the treatment of the ejaculatory canals can be considered. Moreover, there should be no active inflammatory condition either in the seminal vesicles or in the posterior urethra. If these rules are adhered to, all accidents will be avoided.

In some sixty odd cases in which I have catheterized the ducts, I have never had a single accident which could be attributed to this surgical procedure, and it is only because I have always acted with great circumspection, proceeding to the catheterization of the canals only after having thoroughly prepared and studied the individual cases.

Injection Into the Seminal Vesicles

Simple catheterization of the ejaculatory ducts is greatly to be preferred to the injection of various solutions into the interior of the vesicles. Indeed, the cardinal value of catheterization of the ducts lies in the dilatation of the ducts and therefore in the improved drainage which it assures to the inflammatory products; to this corresponding degree it must be evident that injections into the vesicles without this improved drainage must be hazardous and even dangerous.

In point of fact, it is absolutely impossible, at the present time, to determine the exact location, form, and dimensions of the seminal vesicles, so that it is difficult to decide upon the quantity of fluid that is required to fill the vesicles completely. It, therefore, happens quite frequently that the injected fluid does not escape from the vesicle. It remains in the vesicular cavity diluting and disseminating the infected products without bringing about any curative effect. On the contrary, the only time that I succeeded in injecting any liquid with certainty into a seminal vesicle (it was boric solution), an epididymitis developed in the corresponding testicle two days later. But strange to relate, this epididymitis passed off rapidly, without any fever and almost without pain, the patient having been made aware of the inflammation only by reason of the increased weight of the testicle.

The cavity of the seminal vesicles can in no way be compared with the pelvis of the kidney, the normal capacity of which is usually the same and which is easily distended; when the limit of distention is reached it is distinctly and instantly felt by the patient on account of the pain which immediately follows.

Finally, in conclusion, catheterization of the ejaculatory ducts is the only method to employ,—it facilitates drainage of the infected vesicles, and it would appear that any injections into the cavity of the vesicle must not be attempted until we are better informed than we are today.

[The editor assumes the liberty of supplementing the above remarks by the following: Recent improvements in technic have enabled us to secure splendid radiograms of the seminal vesicle, thus giving us exact information as to the size, shape and location of the organ. Likewise, we are enabled to determine whether the injected fluid remains in the vesicle or passes through the ejaculatory ducts, by the simple expedient of injecting argyrol or any other colored fluid through the vas deferens, and immediately thereafter passing a catheter into the bladder. The colored fluid will be found to have entered the bladder via the ejaculatory ducts and the posterior urethra, if the ducts are

patent. If the ducts are stenosed, the fluid will remain in the vesicle and the bladder urine will not be changed in color. If both sides are to be tested at the same session, different colored fluids are injected, and drawn off separately from the bladder. The test is simple and absolutely reliable.—EDITOR.]

Operative Technic: Catheterization of the Ejaculatory Ducts

The description and operative technic of my urethroscope having been thoroughly described above (see page 43) we shall not return to it at present. For catheterization of the ducts, a thorough urethro-vesical irrigation is given in order to cleanse the urethral mucosa. A long tube 13 centimeters in length is to be preferred. This tube will be chosen according to the caliber of the urethra, the largest diameter possible being selected. The tube is introduced directly into the prostatic fossette up to the anterior aspect of the verumontanum. Several

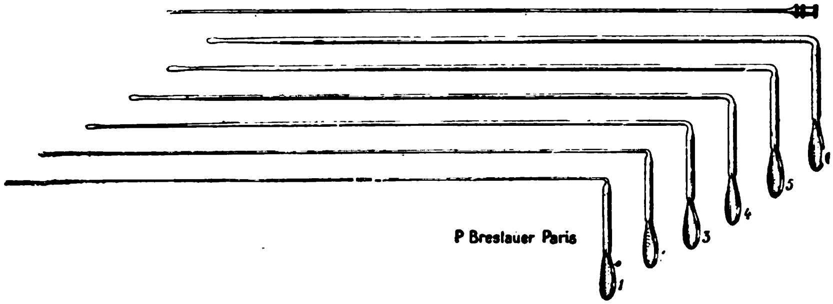

Fig. 86.—Metallic bougies for catheterization of the ejaculatory canals.

views may present themselves, and it is, therefore, fitting to refer to the illustrations that have already been mentioned in this connection.

The simplest case is that in which there exists no median prostatic utricle, but on the lateral sides of the verumontanum on either side of the crest situated symmetrically two very distinct orifices are seen which mark the lower extremity of the ejaculatory ducts. In these cases the verumontanum presents an appearance similar to the diver's helmet (Fig. 79). It goes without saying that catheterization of the ejaculatory ducts in this type of case is comparatively simple.

In catheterization, a straight metallic stylet is preferably chosen, and of the smallest possible caliber, to begin with. The urethroscope is turned about so that the lamp will be above, and not on the floor of the tube. The stylet is then directed horizontally along the entire length of the floor of the urethroscopic tube and easily brought up to the orifice which is to be catheterized. The "button-like" mouth of

the orifice is then penetrated by the stylet in a manner similar to that employed in catheterization of the ureteral orifices. This entrance is facilitated by employing lateral and vertical movements. The stylet having entered the orifice is inserted more deeply, carefully and gently penetrating from one to two centimeters and even up to six centimeters into the interior of the ejaculatory duct. If the slightest resistance is encountered, the movement should be stopped. If these methods are employed, there will usually be no pain nor much, if any, bleeding.

The first stylet having been introduced, a second, of greater caliber is employed in the same manner, and so on up to the largest size; care being always taken to follow the rules of ureteral catheterization; namely, avoiding any undue force or causing any bleeding of the mucosa.

When the ejaculatory ducts can not be detected and with only a single median utricle present, a similar procedure should be adopted. The point of the stylet is directed quite horizontally, so as to make it penetrate directly into the utricle. Then the handle of the stylet is inclined (to the left for the left duct, to the right for the right duct). Then after careful and gentle manipulation, the orifices of the ejaculatory ducts will be discovered and penetrated as above described.

Results Achieved Through Catheterization of the Ejaculatory Ducts

Ever since I have adopted catheterization of the ducts as an indispensable and essential factor in the treatment of chronic spermatocystitis, the results in my practice have been entirely satisfactory. In these cases, the evacuation of the pathologic products retained in the vesicles has been accomplished by means of massage under conditions of improved drainage which the extensive dilatation of the ejaculatory ducts has made possible, and the results have been most satisfactory.

The following case is one of the most interesting and instructive that has come under my observation, in which catheterization of the ducts was successfully performed with excellent results:

The patient, M. G., aged forty years, was brought to me by M. Habibollah, an extern of the hospitals of Paris. This patient had had three attacks of gonorrhea, almost all of them being accompanied by various complications which included prostatitis and orchitis. When he visited me in August, 1912, he had an abundant discharge which contained gonococci. His urine was uniformly turbid in all four glasses. Examination showed the existence of a very clear-cut case of chronic prostatitis; the epididymes presented hard indurations; the seminal vesicles, especially the left, were painful to the touch.

Treatment consisted at first of thorough urethrovesical irrigations with permanganate combined with massage of the prostate and of the seminal vesicles. Dilatation of the urethral

PLATE VII

Fig. 1.—*Normal appearance of the urethral bulb.* The central figure takes on the form of a vertical cleft; the appearance of this region is highly characteristic.

Fig. 2.—*Pediculated polypus* of the bulbous region seen through the urethroscope.

Fig. 3.—*Enormous cystic gland of Littré* easily destroyed through vigorous dilatations.

Fig. 4.—*Lacuna of Morgagni chronically inflamed.* Its complete disappearance can be secured only by the application of the electrolytic needle directly upon it.

Fig. 5.—*Soft infiltration* of the urethra (typical urethroscopic aspect). The puffed up, oozing masses have an appearance similar to a mass of hemorrhoids.

Fig. 6.—*Stricture of the urethra.* This figure is analogous to that of Plate VI, Fig. 2. It shows also the pasteboard-looking appearance of the urethral walls.

Fig. 1.

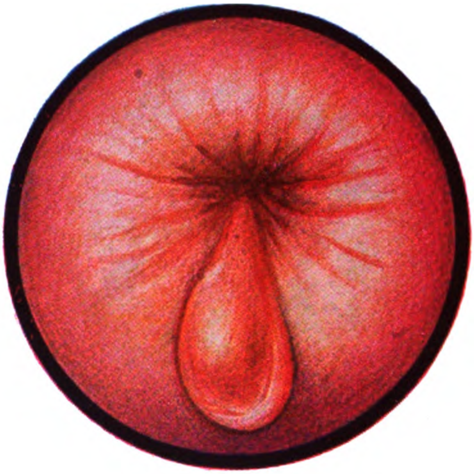

Fig. 2.

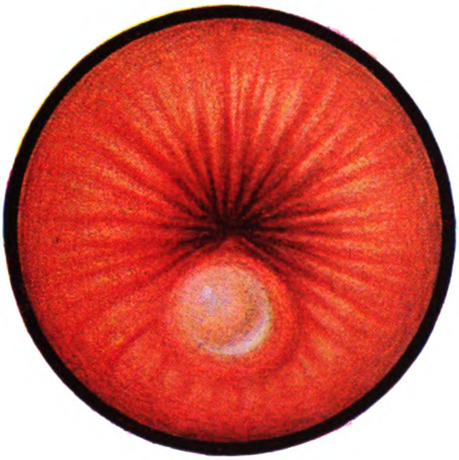

Fig. 3.

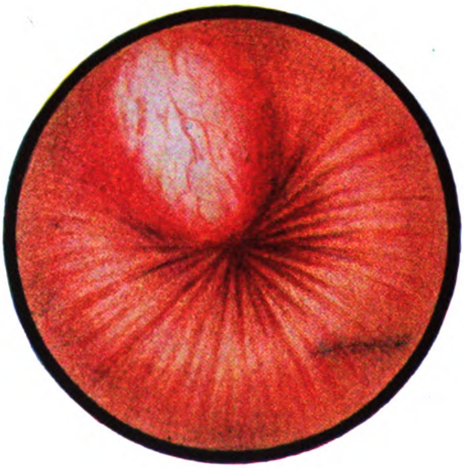

Fig. 4.

Fig. 5

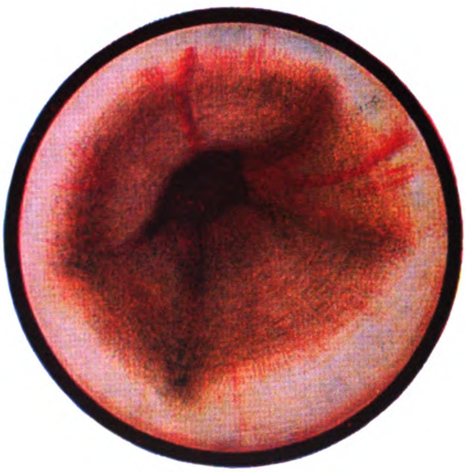

Fig. 6.

PLATE VII

canal was then instituted at first with curved sounds, later with Franck's three-branched irrigating dilator.

Nevertheless, the left vesicle was still extremely painful early in January, 1913. In addition, the highly important fact was noted, that the contents of the left seminal vesicle could not be evacuated by massage vigorous enough to cause severe sharp pain. One day an attack of epididymitis in the left testicle was provoked by a massage, no instrument that might have accounted for it having been introduced into the urethra. Though the attack kept him in bed three or four days, the reaction was slight and the inflammation yielded to treatment quite readily. This occurrence, combined with the above noted observation, clearly demonstrated that massage was not emptying the seminal vesicle and that in consequence the ejaculatory canal was undoubtedly choked up with the debris. In these circumstances it was but natural that an attempt be made to reestablish a free lumen in the duct.

After all evidence of inflammation in the canal had disappeared, I made a urethroscopic examination on January 17, 1913, with a tube No. 26 caliber. The verumontanum was easily visible and because of the antecedent local treatment there was no inflammation or bleeding.

The orifices of the ejaculatory ducts were found on the lateral sides of the verumontanum. On the left side, the orifice of the corresponding duct presented clearly, and I tried to catheterize it with a fine urethral sound No. 5; but the tip of the stylet immediately slipped on the swollen and smooth surface of the verumontanum and refused to enter the interior. I then took a metal stylet with a studded tip and I noted that its end penetrated the orifice of the duct with the greatest facility. The tip, being slightly conical, was at first arrested somewhat, but it soon entered the lumen of the duct for a distance of about one and a half centimeters.

Immediately after this catheterization, the bladder was filled with oxycyanide solution and the left seminal vesicle massaged. To my great surprise and gratification, I found that massage hardly produced any pain. In addition, I saw that it was followed immediately by the evacuation of enormous purulent clots which ran into the glass held at the urinary meatus. Never before had massage produced such an evacuation in this patient.

Following this procedure, not only was there no untoward local reaction, but the hardened left epididymis diminished in size and the urine became normal and absolutely devoid of shreds. This improvement continued, for the patient remained in the same satisfactory condition when I saw him ten days later.

It seems then beyond any doubt, that in accordance with this observation, catheterization of the ejaculatory ducts may and should be advised when the canals present a stenosis which prevents the normal evacuation of the secretion products of the seminal vesicles.

Catheterization has likewise produced the happiest results in disturbances of ejaculation whether they have been characterized by pain, or retardation, prematurity or bleeding.

I have also had occasion to treat a colleague who for years manifested the tenderness which I have emphasized above and who also had become thoroughly neurasthenic because of the pains which he suffered after every coitus. He had a marked chronic posterior urethritis accompanied, as it always is, with a clear case of chronic spermatocystitis.

The treatment at first consisted of dilatation of the urethra. This was followed by a thorough cleansing of the verumontanum, thus freeing it of several little polypi and vegetations. This was accomplished by burning them with the galvanocautery. The treatment culminated

in the catheterization and dilatation of the ejaculatory ducts. The last step alone relieved him of his suffering. The vague pains, constant and severe, which had made his life almost unbearable, also disappeared. This was undoubtedly a clear case of stenosis of the ejaculatory ducts. Indeed though the smallest metallic sounds passed into the ejaculatory ducts quite easily, to the contrary, the larger sounds were passed only through the application of gentle force which produced a sensation like that produced in urethral stricture.

In other cases, phenomena of delayed ejaculation resulting in certain types of sterility are sometimes observed. A man aged thirty years, married one year, was referred to me, by Alexandre, in January, 1914, the complaint being that he was childless though very anxious to have a child. He also complained of pain at the moment of ejaculation. Posterior urethroscopy revealed the cause of his troubles.

The verumontanum was much deformed. Its anterior wall appeared eroded, and the prostatic utricle projected forward so that it resembled a uterine neck. This was evidently the cause of his sterility, for at emission there was no projection of the seminal fluid. The semen accumulated in the eroded pocket of the verumontanum and escaped from the meatus fully ten minutes after the orgasm. This anatomic deformity, very unusual by the way (Plate V, Fig. 1), explained clearly and surely the pain at the moment of orgasm as well as the sterility. Urethroscopic therapy consisted in destroying the anterior wall of the pocket of the verumontanum with the galvanocautery and as a result the ejaculatory pains disappeared entirely.

In other cases the symptoms in connection with emission are less marked, but they exist, nevertheless, and the simple dilatation of the ducts is sufficient to cause their disappearance. I recall a patient, forty-three years of age, in whom the ducts were dilated three or four times; and after this treatment, he informed me that it had restored the virility of his youth and that never before had sexual relations been so pleasant.

In still other instances, the ill-defined pains from which the patients suffer during the sexual act, keep them from indulging, and thus tending to inculcate the belief that they are really impotent. As a result, when these pains cease after treatment, they are perfectly happy to note the return of their virility.

Finally, I have observed in a number of instances, without being able to offer any explanation for the phenomenon, that the induration in the epididymis which followed an acute inflammation has disappeared in many cases as the result of the systematic and methodic dilatation of the ejaculatory ducts. Doubtless this was due to the indi-

rect effect produced by the drainage, thus permitting the easy evacuation of the infected products in the seminal vesicles.

As a result of this study we may conclude that catheterization of the ducts is a maneuver which should be carried out as a routine treatment; furthermore, when properly performed under favorable circumstances, it has never produced the slightest inflammation or accident. We may safely say that catheterization of the ejaculatory ducts constitutes one of the finest achievements of modern urethroscopy.

ENDOURETHRAL TREATMENT OF PROSTATIC HYPERTROPHY

Freyer has demonstrated conclusively the undoubted value of transvesical prostatectomy in the treatment of hypertrophy of the prostate. There can be no doubt that this operation, in experienced hands, frees the patient from the thralldom of the catheter and from the dangers which accompany its use. But it is, nevertheless, true that while this operation is decidedly indicated in the case of a very large prostate, there are many instances in which the distress evidenced by the patient is not of sufficient intensity to justify an operation of such admitted gravity.

It is admitted that the operation is demanded in complete retention, in the presence of a very large prostate, or when the urine is infected. On the other hand, however, with incomplete retention of clear urine, varying in quantity between fifty and two hundred cubic centimeters, but accompanied by increased frequency, pain at the beginning and end of urination, and diminution in the power of the stream, the operation is truly out of all proportion to the symptoms observed. It is in this type of case that the endoscopic treatment should be undertaken.

This method of treatment has been applied by all observers who have taken up posterior urethroscopy systematically, and Goldschmidt, one of the pioneers, obtained appreciable results. Unfortunately, as Harpster has pointed out,[1] Goldschmidt's instrument is very delicate, the lamp deteriorates easily, and in addition, hemorrhage is frequently produced which completely obscures the field of vision.

The use of endoscopy in prostatic hypertrophy is found to be completely justified by the anatomic condition of the deformities which result in the urethral canal. In the numerous researches which I have made in cases of prostatic hypertrophy, one fact has seemed to me to be constant; namely, that in every case with retention of urine, my urethroscopic tube, instead of penetrating easily and directly into the prostatic urethra and the bladder, was always stopped at the neck of

the bladder by a prostatic bar. This bar is invariably located at the same place; i. e., at the prostatic fossette, which is situated in front of the vesical neck and behind the posterior aspect of the verumontanum; in prostatic hypertrophy this space naturally undergoes a decided anteroposterior lengthening.

Consequently, the introduction of a straight tube into the posterior urethra is always impeded in prostatic hypertrophy by this prostatic bar, which prevents the tube from entering the bladder. It is then quite natural to expect that therapeutic efforts should tend toward the elimination of this bar so as to prevent the accumulation and retention of the urine; this is what Bottini sought to effect by blind methods with his galvanic incisor. This operation has been completely abandoned for the reason that it was done completely in the dark.

The endoscopic method, on the other hand, is used under the control of the eye and can be readily regulated both as to the intensity of the action, as well as to the extent of surface to be dealt with. The numerous endoscopic investigations which I have made, have given me the form and the size of this prostatic bar. Practically always it may be likened to a roof with two sloping sides. One of these slopes toward the bladder; in general, its degree of declivity is rather slight. The other slopes toward the urethra and its declivity is usually more abrupt, almost vertical at times. Often, the top of the roof, which is the junction of the two sides, constitutes a more or less acute angle, but occasionally it is flattened in the form of a plateau.

The treatment to be applied to the prostatic bar aims at its complete destruction both from the urethral and vesical directions. In this connection, it would appear at first thought that the urethral approach is the easier of the two, but such is not at all the case. On the contrary, the prostatic bar is best attacked from the vesical direction with my direct vision cystoscope, and it is only at the end of the treatment when it is advisable to complete the work on the urethral side, that the simple urethroscopic tube can be employed to advantage.

REFERENCE

[1]Harpster: Prostatotomy by the Method of Goldschmidt, Section on Genitourinary Diseases, Am. Med. Assn., 1913, p. 280.

Operative Technic

The operative technic is simple. For the operative details, the reader is referred to page 229. The cystoscopic tube passes easily into the bladder in the vast majority of cases, facilitated by the elbowed

obturator. Once introduced into the bladder and the urine withdrawn, the base of the bladder and the two prostatic lobes are identified. The normal groove between the lobes is followed, the tube being withdrawn gradually in the meantime. The vesical slope of the prostatic bar is now observed, and the cauterization begins at this point. A few drops of cocaine solution are deposited on the spot which is to be attacked. Then having waited a few minutes for the anesthetic effect, the vesical aspect of the prostate is burned with the galvanocautery point.

The operator thus digs a real ditch in the prostate; and when it is done skillfully, it is very curious to note that there is little or no hemorrhage. This cauterization produces just a little black, dry eschar from which there is no oozing of any kind. As the cystoscopic tube is slowly withdrawn with the cautery in action, a real bed of fire is thus dug on the upper margin of the prostate until the tube reaches the urethra.

This procedure can not be completed at one sitting. Very deep cauterizations of the prostatic bar do not give satisfactory results; and the best results are attained when the applications of the galvanocautery are made at fairly long intervals, the most satisfactory being about once in eight days. With these precautions in mind, accidents will never occur.

The first application is usually the most difficult, for the road has not yet been prepared. The prostate is congested and bleeds easily at the slightest contact. With patience and the observance of due precautions, really interesting results may be expected.

The best way to determine that the operation is finished, i. e., that the prostatic bar has been completely destroyed, and that there is no further danger of a relapse, is to make an examination with an ordinary straight urethroscopic tube. If this tube passes without difficulty directly from the urethra into the bladder, it indicates that the prostatic bar no longer exists and that the desired result has been attained.

Results of the Treatment

The results are decidedly conclusive. Two principal facts are to be noted after this treatment. On the one hand, the complete disappearance of the bladder residue which was formerly present, and on the other hand, the increased force of the urinary stream. The patient who before the treatment used to "urinate on his boots," to use a hackneyed phrase, now has a strong and normal stream.

Among the cases which I have treated in this way, one is of particular interest. The patient, aged forty-seven, complained of difficulty in urination. This consisted first, in the fact that it took some time to

start the stream; next, there was a diminution in the force and volume of the stream, and finally, that he suffered pain at the beginning and end of the act. Residual urine was clear and amounted to only 50 c.c.

Examination of the bladder with the urethroscopic tube was prevented by the existence of a large and well-defined prostatic bar. Only a tube with elbowed obturator could be passed into the bladder. Treatment with the direct vision cystoscope extended over a period of about three months. At the end of that time as the result of many applications of the galvanocautery, the urethra was completely freed of its prostatic bar. The straight urethroscopic tube easily passed from the urethra into the bladder. Not only was the patient relieved of his pains at the beginning and end of urination, but in addition he noted with joy that his stream was large and had an excellent projection; he urinated without any delay and his residuum was nil.

CHAPTER IV

CYSTOSCOPY

Cystoscopy may be defined as the examination of the vesical mucosa under the control of the eye with special optical instruments, through the natural urinary passage and without surgical incision of the bladder. Cystoscopy has become one of the most essential methods of exploration in urologic practice. Its indications are innumerable; its field of action is very great, for it includes all affections of the prostate, kidneys, and ureters.

Without cystoscopy it is absolutely impossible at the present time to make a correct diagnosis in disease of the kidneys. Likewise we are enabled by means of meatoscopy, that is to say, the inspection of the orifices of the ureters, as well as through catheterization of the ureters and the collection of the separate kidney urines, to determine to a mathematical certainty whether one or both kidneys are diseased. Cystoscopy, therefore, not only furnishes the correct diagnosis in kidney affections, but what is still more important, it determines quite clearly the condition of the diseased organ and the indications for nephrectomy, when necessary.

Again, the introduction of a catheter into the kidney pelvis, enlightens us as to its capacity and makes it possible also to evacuate its pathologic contents. Antiseptic lavage of the pelvis can thus be performed; this method of therapy will usually improve and at times completely cure certain mild cases of pyelonephritis.

Still further, by the introduction of opaque liquids such as collargol into the interior of the kidney pelvis, combined with the roentgen ray, we are enabled to obtain a clear radiogram of the pelvis and to deduce important diagnostic and therapeutic conclusions.

In ureter disease, such as calculi, tumors, kinks, etc., cystoscopy permits the introduction of a catheter into the ureter, which tells us whether the latter is patent, obstructed, or kinked. The information of the presence of a foreign body; i. e., calculus, in the ureter, thus obtained, will result in eliciting the proper indications for surgical intervention.

In addition to the data derived within the ureter, the ureteral catheter also furnishes other and highly important information. By

means of a metallic stylet within the ureteral catheter or the x-ray catheter impregnated so as to intercept the roentgen rays, we are enabled to take a radiogram of the pelvis, as well as the direction and shape of the ureter.

Finally, one of the most interesting and useful applications of the ureteral catheter from the therapeutic standpoint is found in connection with renal colic. I have often had the opportunity of observing during the crisis in nephritic colic, that a ureteral catheter introduced between the calculus and the ureteral wall on being rather suddenly withdrawn will initiate a downward movement of a hitherto stationary calculus and culminate with its subsequent exit from the ureter into the bladder.

Cystoscopy is distinctly indicated in all affections of the bladder. It is only by the aid of this means of examination that the exact diagnosis in bladder disturbances can be made. Thus, tumors of the bladder, for example, are easily recognized, and it can not be denied that the precision of this method of diagnosis is far superior to the older clinical methods of palpation which always left the diagnosis vague and uncertain. Indeed, it is not too much to say that an experienced cystoscopist can often distinguish at a glance between a benign and a malignant growth, thereby affecting the prognosis considerably.

When a stone is suspected, cystoscopy can be relied upon to give a positive diagnosis; for, although the presence of a large stone can be determined by the aid of a metallic searcher in the bladder, it is a fact that small stones may completely escape identification by this method. Likewise when small stones are encysted between trabeculæ or in diverticulæ, their existence can be discovered only through the aid of the cystoscope. The same is true after lithotrity, when it is necessary to make sure that all the fragments have been thoroughly evacuated and that there are no more in the bladder. Cystoscopy is invaluable for this purpose.

Foreign bodies in the bladder can not really be diagnosed except by the aid of the cystoscope. When they have lain for a long period in the bladder, they are usually covered over with a layer of phosphatic salts which eventually transforms them so that they resemble a true stone. Cystoscopy makes the diagnosis exact by revealing their correct size and shape.

In all cases of chronic cystitis, cystoscopy is indicated for the purpose of determining the bladder condition and its etiology. In tuberculosis, for example, the ulcerations resembling finger scratch marks are so typical and characteristic of this disease, that the real cause of the cystitis may be attributed to the Koch bacillus on the strength of these findings.

Cystoscopy is also indicated in disease of the prostate. In prostatic hypertrophy in particular, cystoscopy makes it possible to distinguish not only the enlarged lobes, but also the true shape of the organ and the amount of projection of the lobes into the bladder. The median lobe and its various conformations can likewise be carefully studied. This method of examination is useful in many ways and should never be overlooked. As Marion[1] has well put it: "Cystoscopy enjoys the particular faculty of revealing entirely unsuspected lesions at times, especially calculi and tumors, in cases in which the functional disturbances were not of sufficient gravity to attract special attention; in this manner cystoscopy offers exact information upon which specific therapy may be based."

In prostatic hypertrophy the normal aspect of the vesical neck is altered to a variable degree. There are important modifications in the reciprocal relations between the neck of the bladder and the ureters. Indeed, under the influence of prostatic enlargement the hypertrophied neck is drawn upward and backward, while the orifices of the ureters remain stationary. Consequently the distance from the vesical neck to the fundus is increased perceptibly. Cystoscopy also reveals the existence of a vesical lesion which is always constant in prostatic hypertrophy; that is, the presence of columns of trabeculæ disseminated over the entire surface of the vesical mucosa and especially at the fundus.

Finally, cystoscopy finds one of its most frequent applications in the numerous urinary disturbances, by enabling us to interpret the conditions which apply to the kidneys, bladder, ureters, or the prostate. We can, therefore, readily see what a great field cystoscopy enjoys, and the numerous conditions in which we may have recourse to the enlightenment which this marvelous method of examination affords for the study of urinary disturbances.

However, though we may regard cystoscopy as indispensable in almost all diseases of the urinary apparatus, it may also be applied in many pathologic conditions quite distinct from the urinary tract proper. Thus in uterine disease, cystoscopic indications are numerous. During pregnancy, for instance, the uterus causes the bladder to undergo important changes, which are referred to in a later chapter. In cancer of the uterus, the bladder condition will very often give evidence which may necessitate complete abdominal hysterectomy (see page 207).

Previous to a laparotomy for uterine cancer or fibroid, it is very important to insert a ureteral catheter into each ureter so that it will act as a landmark or guide during the operation. This will prevent injury to the ureters during the process of decortication or excision.

For want of this precaution, ureters have been injured by many general surgeons during this operation. In salpingitis, cystoscopy is also highly important, and I have been able to observe its usefulness in this condition in several instances. In a case of right salpingoovaritis a patient in the service of Arrou at the Hôpital de la Pitié, also complained of clearly defined pains referred to the right kidney; and considering the grave accompanying conditions, such as increased temperature and poor general condition, it was practically impossible to determine clinically whether the symptoms observed were due to the salpingitis or to a pyonephrosis. Cystoscopy showed that the right ureteral orifice did not functionate properly and did not present normal clean-cut urinary ejaculations. In addition it showed that this ureter was impermeable to a No. 6 catheter, thus forcing the conclusion that this canal had become constricted somewhere. The patient was put to bed with ice applications to the abdomen. This treatment was followed by excellent results, for as soon as the inflammatory condition of the right tube improved, the renal troubles disappeared completely and the pains did not return.

In other cases cystoscopy enabled us to locate the openings of pus collections in the bladder of salpingitic origin. The cystoscopic appearance of these vesical perforations has been drawn from nature in Plate X, Fig. 2. Reports of two cases follow.

Case 1.—Suppurative salpingitis with localized peritonitis perforating the bladder. A woman, L. E., aged twenty-nine, was sent to me at the Broca Hospital, by Arrou, on December 13, 1912, with purulent urine. Pus had suddenly appeared in the urine in January, 1911, and from that date had never disappeared. Cystoscopic examination showed a healthy bladder throughout; however, a large fleshy pimple was observed on the base of the bladder, behind the ureteral orifices. This large mass obscured an orifice through which pus was exuding; and which admitted a catheter No. 5 for a distance of about one centimeter. The ureteral orifices appeared to be normal.

This was undoubtedly an abscess which had ruptured at the fundus of the bladder. Operation was performed by Arrou at the New Pitié Hospital on December 19, 1912. In the course of the laparotomy he was able to determine that there was a perforation of the bladder at the fundus and that the pus was emanating from an enormous salpingitis situated in the lower pelvis. Both tubes and the uterus were removed.

Case 2.—A woman, B. B. J., aged twenty-nine, was referred by Arrou, on March 25, 1911, at the Broca Hospital, because she had very purulent urine. Double catheterization of the ureters showed that the two kidneys were secreting perfectly clear urine and that the pus could not possibly come from that source. Vesical cystoscopy, on the other hand, showed that while the entire vesical wall was generally normal, the base presented an edematous plaque studded with tender papules. This was probably the site of a vesical perforation. Vaginal examination revealed an enormous salpingitic mass which was attached to the uterus.

Perforation of the Bladder by an Abscess of the Iliac Fossa.—Cystoscopy is also useful in cases of iliac abscess, as the following case illustrates:

On April 1, 1909, M. le Moine, an intern in the service of Rochard at the Hôpital St. Louis, requested me to examine a patient who had a severe pyuria, probably of kidney origin. On April 8, I saw the patient, a woman aged thirty-eight, who had entered the hospital on February 19, 1909, complaining of pains in the right iliac fossa; she had an afternoon temperature of 38.8° C. On January 5 preceding, she had given birth to a healthy child. On entrance to the hospital she had clear urine, but a few days later her urine suddenly became quite purulent, with pain at the end of urination. Simultaneously the temperature dropped to 37° C.

In spite of vesical lavage with nitrate of silver, the pyuria did not diminish. In addition there was a painful swelling in the right groin, suggesting the possibility of a purulent collection at the right broad ligament which had worked itself down to its lower margin by following the round ligament. With my direct vision cystoscope I saw that the bladder

Fig. 87.—Star-shaped cicatrix resulting from a perforation of the bladder, due to an abscess of the right iliac fossa.

was normal over almost its entire area. Both ureteral orifices were normal and gave no evidence of inflammation. However, at the junction of the posterior and right superior walls a little fiery-looking mass was visible, about the size of a franc piece, and made up of fleshy looking papules which bled easily on contact. These papules admitted the introduction of a ureteral catheter provided with a metallic stylet to the extent of about one centimeter. Just as soon as the stylet was withdrawn, however, a mass of thick pus, like custard or cream inundated the entire bladder; this showed the undoubted existence of a vesical perforation, which was quite contrary to the original diagnosis of renal pyuria.

Late in April, 1909, the skin in the region of the right groin became red and inflamed, and when the tumefaction which had formed there was incised, a profuse pus collection was evacuated. It was then drained for about fifteen days. Immediately after the incision of

this abscess the urine cleared up and remained quite clear when the wound had healed. I examined this woman a second time on May 19. The urine was still clear, and the bladder perfectly normal throughout; and instead of the perforation which was visible six weeks previously, there was simply a small air-tight scar (Fig. 87).

In diseases of the intestinal tract, especially cancer, cystoscopy will very often verify the presence of adhesions or perforations which may be present as the result of the neoplastic process. In appendicitis also, cystoscopy may be useful in avoiding errors in diagnosis which

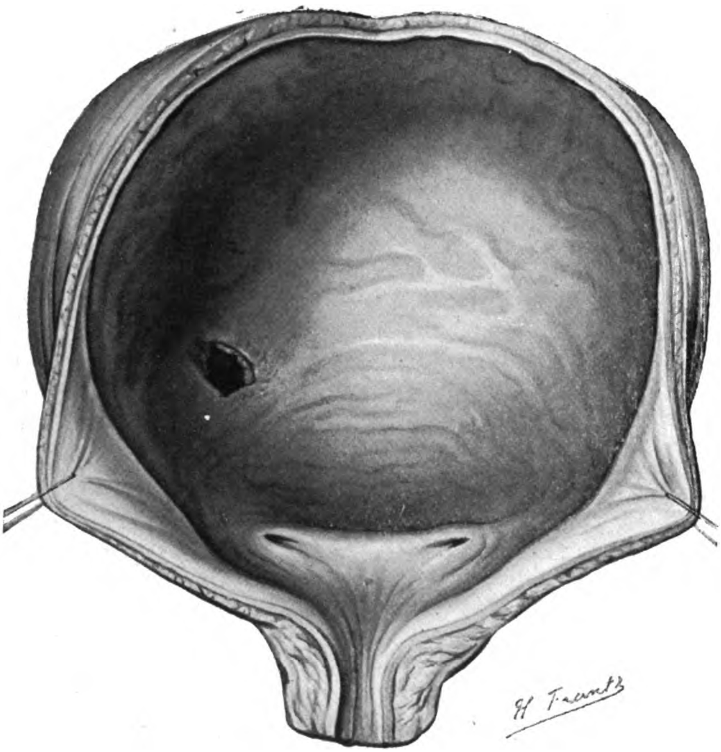

Fig. 88.—View of a vesical perforation of an adjacent abscess.

may be harmful. It is well-recognized that it is often difficult to determine the clinical diagnosis between appendicitis, ureteral calculus, floating kidney, and renal colic. By studying the ureteral orifices we can learn whether they are normal or otherwise; if they are not normal in appearance, the diagnosis points to a lesion of the ureter or kidney, thus eliminating the appendix entirely.

In appendicitis I have had occasion to observe appendicular abscesses which perforated the vesical wall and opened into the bladder. The following is a report of one of these cases:

Mme C. B., aged fifty-four years, entered the Hôpital Saint Louis on October 24, 1908, in the service of Rochard. Some days previously, she noticed that her urine suddenly became extremely turbid and muddy and she complained in addition, of severe pain on urination. She was pale and very weak while her temperature oscillated around 39° C. On examination it was noted that the right kidney was clearly lowered and easily palpable bimanually, and seemed to be sensitive to the touch. The pain provoked by the hand placed on the anterior abdominal wall extended to the right side of the abdomen, which presented marked muscular resistance extending to the right iliac fossa. The left kidney could not be palpated. In the presence of such unmistakable symptoms, the diagnosis based on the purulent urine, the pain and the bimanual examination of the right kidney seemed unmistakable; it was quite apparent we were dealing with a large right pyonephrosis.

Before operating on the right kidney, however, M. Bodolec, the intern on duty, asked me to examine the patient and to secure the separated urines. I examined her on October 27. The vesical urine obtained through a catheter was horribly fetid and muddy and had the color and consistency of pus. The vesical capacity was normal, and measured at least 200 c.c. After thorough lavage of the bladder, I applied my separator without any difficulty and after a few moments, and quite contrary to all expectations, the right side of the separator produced a perfectly clear urine, the same as came from the left side. During the first ten minutes the right tube constantly gave forth clear urine, but at the end of that time, a heavy discharge of thick, creamy pus appeared on that side. A little while later, clear urine again appeared on this side. The appearance of the right tube was quite characteristic: below, clear urine; in the middle, pure pus; above, clear urine. On the left side, the urine remained clear throughout the entire examination.

Analysis of the separated urines was made by the staff intern in pharmacy with the quantities of urine for both kidneys about the same:

	Right Kidney	*Left Kidney*	*Bladder*
Cryoscopic Point	—0.48	—0.54	—1.03
Urea (per liter)	4.80 gm.	5.25 gm.	6.75 gm.
Chlorides (per liter)	2.70 "	2.80 "	3.10 "

The result of this analysis showed that there was very little difference between the two kidneys and that the enormous flow of pus in the right tube of the separator did not seem consistent with the relatively satisfactory kidney examination. We were then dealing with something extrarenal and the right kidney could not be held responsible for the profuse pyuria. I, therefore, suggested that a cystoscopic examination be made.

The following day, October 28, I applied my direct vision cystoscope. I saw that the bladder generally was normal, the ureteral orifices did not differ from one another, and that the base of the bladder was but slightly inflamed. But behind the plane of the ureteral orifices to the right of the medial line, a gaping circular orifice was seen; it had clean-cut edges and thinned walls and was about eight millimeters in diameter. From the lumen of this opening, purulent masses issued.

These cystoscopic findings fully confirmed the tentative diagnosis and explained very clearly the data previously furnished by the separator. The pyuria was certainly due to a perforation of the bladder following an extraneous abscess which had ruptured into it. The data furnished by clinical observation exclusively was entirely wrong; the cystoscope proved beyond doubt that the suspected right kidney was unaffected and that the pyuria came from an adjacent abscess.

This diagnosis was later confirmed at autopsy, which was performed by M. Bodolec. The vesical perforation was found exactly in the spot which had been indicated by cystoscopy, that is to say, about five centimeters behind the right ureteral orifice. The edges of this opening were perpendicular and did not seem to be the seat of inflammation; the bladder wall at that point was of normal thickness.

This perforation communicated posteriorly with a vast pocket filled with pus, the origin of which seemed to be an appendicular abscess. In point of fact, the intestines were matted

PLATE VIII

FIGS. 1 and 2.—*Cystic and purulent Littré's glands.* Looking at this picture one can readily understand the therapeutic importance of forcible dilatation, which breaks up these inflamed glands.

FIG. 3.—*Morgagni's lacunæ and Littré's glands* chronically inflamed.

FIG. 4.—*Littré's glands* chronically inflamed.

FIG. 5.—*Pathologic aspect of the anterior surface of the verumontanum* chronically inflamed for years. Exemplifying the "mirror of the seminal vesicles."

FIG. 6.—*Enormous polypus* at the external orifice of the female urethra.

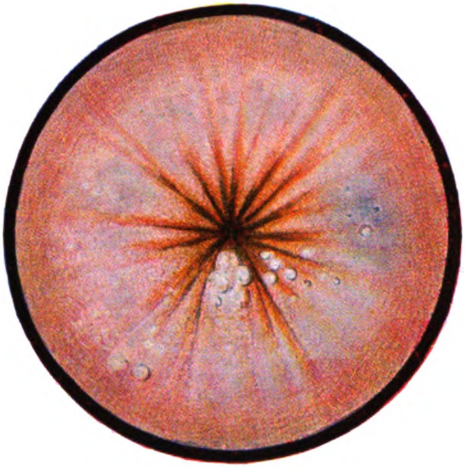

Fig. 1.

Fig. 2.

Fig. 3.

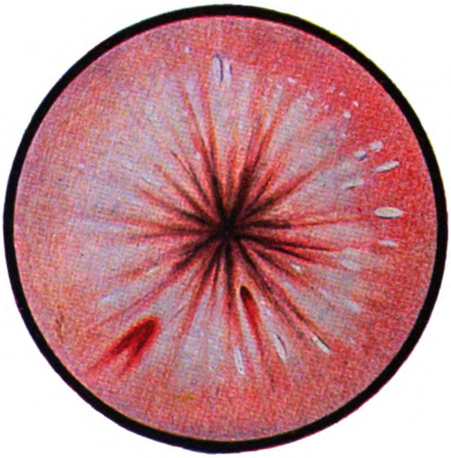

Fig. 4.

Fig. 5.

Fig. 6.

PLATE VIII

together toward the right side of the pelvic cavity and appeared to be adherent to the adjacent pelvic organs. This intestinal mass covered and obscured the bladder and uterus completely and it was only by separating these adhesions that a large purulent pocket situated above and to the right of the bladder was discovered and subsequently opened. The uterus and its adnexa were perfectly normal.

On the right side, the ureter was slightly compressed by the presence of the pus pocket and was slightly dilated below the point of constriction. This explains the somewhat inferior functional performance of the right kidney as compared with the left. On examination, both kidneys were found practically alike in all respects; they each weighed about 135 grams and were rather pale and soft. Neither of them showed any evidence of hydronephrosis. The psoas, the bony brim of the pelvis and the vertebral column were without any lesion whatever.

From this study, the following conclusions may be drawn: 1. In the diagnosis of pyuria, it is absolutely necessary to regard the clinical data alone as insufficient, inasmuch as it may lead to serious error; the methods of instrumental exploration and examination which provide exact information should also be employed. 2. Cystoscopy should always be performed, in addition to the separation of the urines. 3. In performing endovesical separation of the urines, it is very important to study carefully the method of urinary ejaculation and the way in which the pus and urine make their exit from the respective tubes of the separator.

REFERENCE

[1]Marion: La Cystoscopie dans l'hypertrophie de la prostate, Jour. d'Urologie, 1912, ii, p. 33.

ANATOMIC CONSIDERATIONS

In order to become familiar with the bladder with the aid of cystoscopy, whichever instrument may be employed, it is essential to establish fixed and identical landmarks. With this purpose in mind, the bladder may be divided into four principal parts:

The first consists of the superior wall, vertex or dome, which extends forward from the bladder neck and becomes continuous with the second portion or vesical base, after having described its curve with an anterosuperior convexity. This is the largest of the four bladder divisions.

The second is made up of the posteroinferior wall of the bladder, or vesical base (bas-fond) (fundus). It is continued upward and backward with the vesical dome. It is separated from the third portion by the interureteral ligament or muscle, which extends between the two ureteral orifices, thus separating the fundus from the trigone. This interureteral ridge is one of the most important landmarks in cystoscopy for it gives the operator his bearings, so that he can tell in which region of the bladder his cystoscope happens to be, to what depth it has

penetrated, and which segment of the bladder he has under observation.

At times the interureteral muscle manifests itself under the form of a transverse cord which elevates the wall of the bladder. At other times it is hardly noticeable at all, and forms only a transverse coil or fold barely visible. It may be described as follows: A median portion, not very well marked, and two lateral portions which surround the orifices of the ureters like an elliptical pad or swelling, and which determines the prominence of the ureteral orifices above the vesical floor, this prominence varying in different individuals.

According to the investigations of Uteau[1] the total length of the interureteral ridge averages 3.27 centimeters in the male, and 2.68 centimeters in the female. The distance from the middle of the ridge to the neck of the bladder averages about 2.05 centimeters.

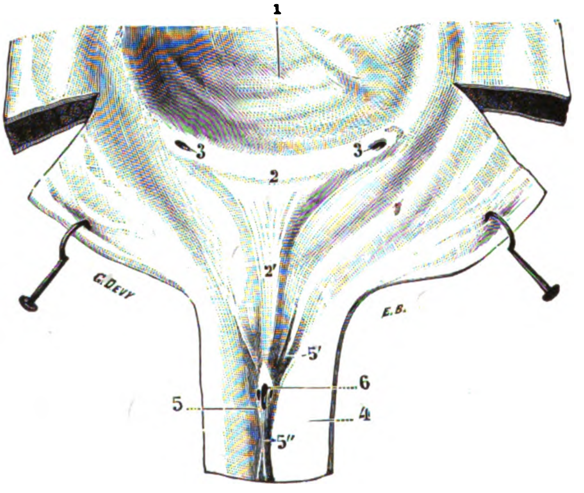

Fig. 89.—The floor of the bladder, showing the proximal portion of the ureter (after L. Testut).

The third subdivision of the bladder consists of the bladder trigone or the triangle of Lieutaud. The three angles which bound it are formed by the internal orifice of the urethra and the two ureteral orifices, one on either side. This portion of the bladder is separated from the fundus, as we have already seen, by the interureteral ligament or muscle. It is continued forward to meet the fourth part, or vesical neck. On the lateral portions of the trigone and immediately adjoining the eminence formed by the termination of the interureteral ridge around the ureteral orifice are found the so-called "paratrigonal planes." At this point the vesical mucosa is often very thin and transparent, so that the course of the ureters may sometimes be observed for a variable distance.

The vesical trigone is by far the most important portion of the

bladder from the cystoscopic standpoint. Indeed, because of its situation immediately adjacent to the orifices of the ureters, the trigone naturally feels the first effect of inflammations involving the kidneys, which empty their pathologic products at this point.

We have already seen that the distance between the two ureteral orifices is equal to the length of the interureteral ridge itself. Considering the distance from the neck of the bladder to one of the ureteral orifices, we find it generally averages 2.75 cm. in the male and 2.27 cm. in the female. We also find that the distance from the ureteral orifice to the median line averages 1.58 cm. in the male and 1.34 cm. in the female.

The fourth portion consists of the neck of the bladder or the internal vesical sphincter. The neck of the bladder offers entirely different cystoscopic appearances, depending on whether the indirect (prismatic) or direct vision instrument is used, and also as to whether the male or female bladder is being examined. The presence of the prostate in the male causes many diverse and variable modifications in the appearance of the bladder neck. This portion of the bladder will be considered in greater detail later (see pages 198 and 247).

REFERENCE

[1]Uteau: Ann. d. mal. d. org. génito-urin., 1905, p. 241.

Normal Color of the Vesical Mucosa.—The normal color of the bladder mucosa is clear yellow or rose yellow, but this is subject to many modifications and variations according to the degree of fullness of the viscus; indeed, the slightest degree of inflammation of the mucosa is made evident by the appearance of a more or less reddish tint. Normally, the mucosa is smooth, glossy, and uniform in texture; but when it is inflamed, it becomes dull, velvety and mucoid in appearance. Cases are often encountered in which numerous depressions or recesses appear, which give a more or less trabeculated appearance, depending on the degree of inflammation present; the bladder in this condition is then described as columnar or trabeculated.

It is of the utmost importance to recognize the vessels of the mucosa which are made visible through the cystoscope. In the normal bladder the arteries are seen principally; these appear in the form of arterial clusters and vascular arborizations, decidedly attractive in appearance and most abundant in the region of the vesical neck. They are often arranged in the form of a star. In other parts of the bladder, their appearance is practically the same as that which ophthalmoscopy reveals at the fundus of the eye.

The veins are usually not visible. They appear like dark lines of a grayish blue color. In the aged, rather thick, superficial veins are often seen, of dark color and varicose appearance.

URETERAL MEATOSCOPY

Meatoscopy is the study of the ureteral orifices in the bladder as seen with the eye through the cystoscope. From the particular appearance of the ureteral orifices we may obtain information which may determine whether there are lesions in the ureters or disturbances in the corresponding kidney.

The points to be examined particularly are the ureteral orifice, the character of the ureteral emission or ejaculation of urine and the situation of the ureteral orifice in relation to a lesion of the bladder, a vesical tumor, for example. Meatoscopy has been studied particularly by E. Hurry Fenwick, who has devoted a great part of his work[1] to this subject, and also by Edgar Garceau.[2]

Examination of the Ureteral Orifices

In order to identify the ureteral orifices, the distance from the neck of the bladder to the ureteral plane should be borne in mind; this has already been referred to (see page 148). But the most important guide in finding the orifices of the ureters readily is the interureteral muscle or ridge; this applies quite as well with the indirect (prismatic) cystoscope as with the direct vision. This is undoubtedly the best guide for finding the ureteral orifices.

[In teaching cystoscopy to American students, the editor has found a most valuable guide in the location of the ureteral orifices, by comparing the vesical field of vision to the face of a clock, and referring to the segments which correspond with the numbers on the clock's face. In this way, it is found that the ureteral orifices are usually located so that they correspond with the number VIII or IX for the right ureter, and III or IV for the left ureter. Thus it is easy to describe the orifice as being near III on the clock, or IX, as the case may be. This always makes it easier for the student, and even for the experienced operator, to locate the orifices, especially when they are very small.—Editor.]

Aspect of the Ureteral Orifices.—In the normal state the orifices of the ureters may present a considerable variety of form, size, and situation. In the vast majority of cases, the orifice is seen as a semi-elliptic projection clearly distinguished from the vesical mucosa; it is

formed like a small nipple, cone, or eminence, more or less rounded and with a cleft in its center or summit.

This cleft is usually simply a line; in other instances, it is in the form of a crescent or a comma. Occasionally it resembles a little boutonniere, similar to a pair of half-closed eyelids. Again the orifice

Fig. 90.

Fig. 91.

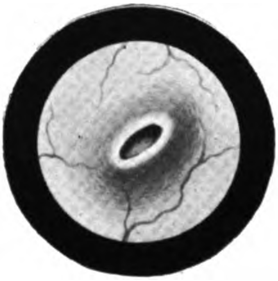

Fig. 92.

Fig. 93.

Fig. 94.

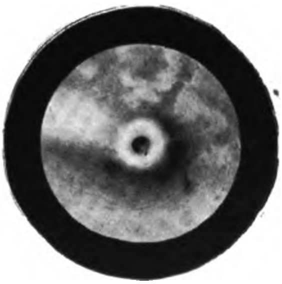

Fig. 95.

Fig. 96.

Fig. 97.

VARIOUS ASPECTS OF THE URETERAL ORIFICES (KNORR[1] AND FENWICK[2]).

Fig. 90.—Normal ureteral orifice projecting like a papilla (Knorr).
Fig. 91.—Normal ureteral orifice in the shape of an oblique cleft (Knorr).
Fig. 92.—Large, open ureteral orifice (Knorr).
Fig. 93.—Ureteral orifice shaped like the beak of a clarionette (Knorr).
Fig. 94.—Ureteral orifice lengthened into a sharp line (Knorr).
Fig. 95.—Narrow ureteral orifice with thickened lips, indicative of a mild pyelitis (Fenwick).
Fig. 96.—Arch-shaped orifice indicative of a ureteral dilatation (Fenwick).
Fig. 97.—Golf-hole-shaped ureteral orifice, indicating a destruction of the kidney, as observed in renal calculus and tuberculosis (Fenwick).

[1] R. Knorr: Die Cystoskopie und Urethroskopie beim Weibe, Berlin, 1908, Urban and Schwarzenberg.

[2] Fenwick: Ureteric Meatoscopy in Obscure Diseases of the Kidney, London, 1903, Churchill.

looks like a scratch mark, something analogous to the impression of a horseshoe on hard snow. It may also be seen in the form of a little circular orifice or a small oval fossette; and finally, it may resemble a more or less gaping chasm.

The orifice is sometimes of very small caliber congenitally; that is, it exists at the time of birth similarly to the congenitally small urethral meatus. This anomaly may remain unnoticed for a long period of years; it is frequently the cause of accidents associated with ureteral and pyelitic dilatation, which at first appear inexplicable. The pathogeny of these accidents is soon revealed by the cystoscopic discovery of this malformation.

The ureteral orifice may also be the seat of a pathologic atresia, owing to the presence of a vesical tumor, and it is then easy to understand the importance of meatoscopy in such cases. Indeed, in such a case, a stricture of the ureteral orifice will bring on a retrograde dilatation of the ureter and of the pelvis and will cause renal pains in the corresponding kidney. Through meatoscopy, we are enabled to determine the real etiology of such pains and are thus prevented from wrongly subjecting the kidney to treatment when the bladder is really affected.

Apart from the matter of size, there are a number of other peculiarities which the ureteral orifices may present. In order to appreciate these peculiarities it is generally necessary to compare the two orifices, one with the other; and in this connection, it is well to note the following facts which have been fully described by Fenwick.

A ureteral orifice may be congested and present marked vascularization. This is an indication of hyperactivity of the corresponding kidney and of a pyelorenal inflammation extending towards the bladder. When the orifice is turgid and elongated and the lips are inflamed and congested, dilatation of the pelvis and of the corresponding ureter is indicated. When the ureteral meatus is ulcerated and presents one or more ulcerations with irregular and jagged edges like a finger scratch around its orifice, and when its orifice is situated in the base of this ulceration, we are dealing with renal tuberculosis (Plate XVI, Fig. 1).

When the ureteral orifice takes on an arched appearance resembling an oval arch, we must think of the first phase of a ureteral dilatation which has extended from below in an upward direction. A ureteral orifice presenting a perfectly circular opening indicates a dilated ureter. Fenwick[1] likens this picture to a "golf hole" (Fig. 97). In this case the orifice is round and the edges small. Its dimensions vary between the small letter "o" and a capital "O," but its lips are never

inflamed. However, the conformation of a ureteral orifice is not always a certain indication of the degree of dilatation of the ureter, for this canal may have the dimensions of a child's small intestine and nevertheless the orifice of the ureter may be but very little dilated. When, however, in addition to this appearance, the lips of the orifice are red and inflamed, it indicates that the corresponding kidney is markedly pyelonephritic and that the renal parenchyma has been fundamentally changed.

When the lips of a dilated, round, ureteral orifice are of a dirty white color, as if they were coated with wax, while the surrounding tissues are red, it is an indication that a periureteritis is present. The ureter then appears like a thick red cord. This appearance is met with especially in ureterorenal tuberculosis. A ureteral orifice may be small, wrinkled, distorted, or irregular. It is then an evidence of a preexistent erosive ureteritis. Occasionally the ureteral orifice is separated in two by a little bridge of tissue; this is generally the result of the cicatrization of a preexistent ureteral ulceration.

A ureteral orifice with a papillomatous appearance indicates the presence of a chronic irritating discharge from the ureter. A similar arrangement may be seen in Plate XII, Fig. 3. It was observed in a woman with acute uric acid diathesis who passed very little urine and this in high concentration. The ureteral orifice was chronically inflamed, particularly that portion which was traversed by the irritating urine which had left its mark by an accompanying inflammation.

In renal lithiasis the slightly conical eversion of the orifice is frequently found. Prolapse of the ureteral orifice may be more or less accentuated. Sometimes it exists only at the very moment of ureteral emission and resembles the rectal prolapse seen in defecation. At other times it may be more accentuated, presenting the appearance of a real hernia of the ureteral mucosa, even simulating at times, a vesical tumor. The eversion of the ureteral mucosa like an inverted finger of a glove diminishes by just so much the dimensions of the orifice and in consequence may result in more or less retention of urine higher up in the ureter.

Retraction of the ureteral orifice is brought about by the fact that the ureteral orifice is situated at the base of a deep depression of the bladder, instead of making its normal projection like a nipple within the bladder (Fig. 98).

In these cases it is well to remember that the ureter which is chronically inflamed and shortened thereby causes retraction of its orifice. It is, therefore, reasonable to assume that this arrangement of the

orifice indicates the existence of a severe pyonephrosis of the corresponding kidney.

Edema of the ureteral orifice is met with very frequently in the course of renal or ureteral lithiasis and especially coincident with or immediately following renal crises. This accounts for the fact that catheterization of the ureter is often very difficult in these circumstances. Indeed, in these instances the orifice is sometimes hardly visible, being lost in a mass of bullous edema resembling small whitish balloons heaped up one against the other and presenting thin reddish

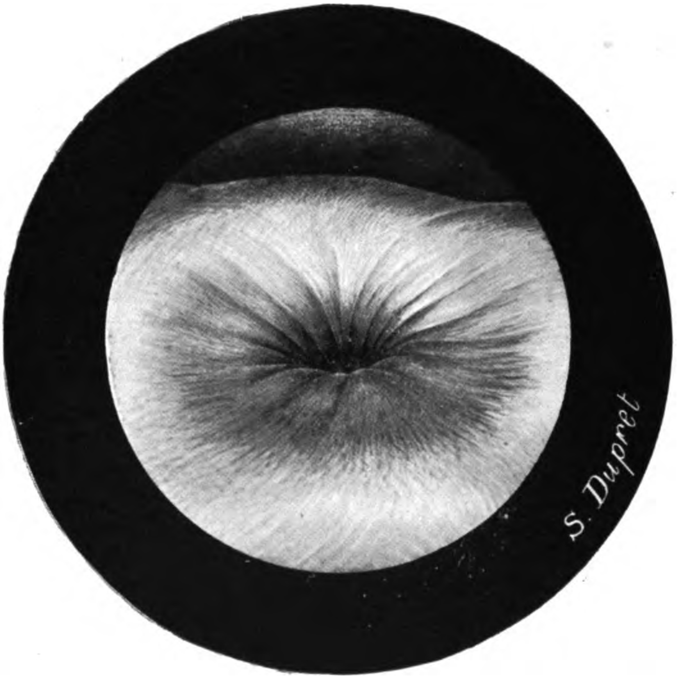

Fig. 98.—Retraction of the ureteral orifice, the result of an inflammation of the ureter.

furrows and vascular arborizations. This edema of the orifice is often the indication of renal tuberculosis. However, it must not be confused with the cystic dilatation of the lower extremity of the ureter which consists of a single swelling of rather considerable size and covered over with a few small vessels.

Intravesical dilatation of the lower extremity of the ureter has been carefully studied by Pasteau,[4] Albarran,[5] and Bazy.[6] This dilatation can be determined only by a cystoscopic examination and appears in the bladder in the form of a sessile tumor more or less fully pedunculated and implanted in the ureteral zone. The surface of this cystic

dilatation is most often smooth and covered over by a normal mucosa, in which fine vascular arborizations may be seen (Fig. 99).

Occasionally the ureteral orifice is situated at the summit of the swelling, but at other times it is almost invisible, and the diagnosis then becomes more difficult. However, when the tumor appears near the ureteral zone, it is always well to think of this condition. Moreover, when the tumor distends itself rhythmically and periodically at the moment of ureteral emission, the diagnosis is quite clear. On the other hand, the diagnosis is not a difficult one when there is a single

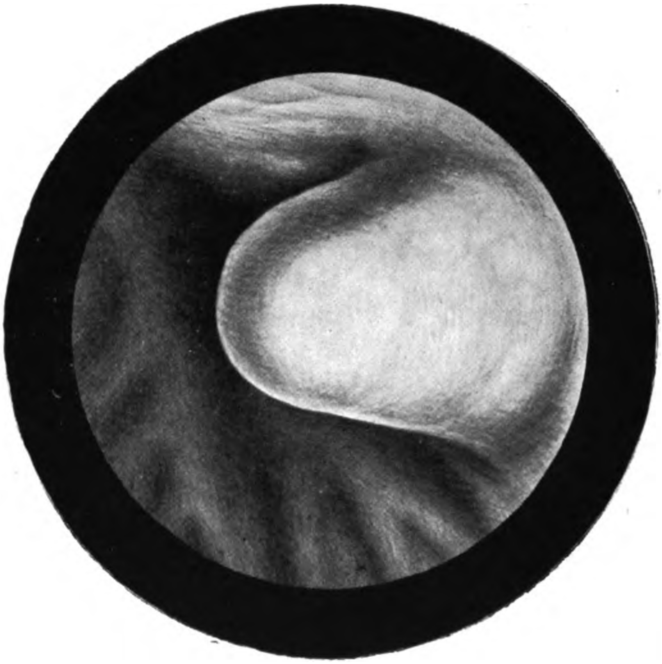

Fig. 99.—Prolapse of the lower extremity of the right ureter; the ureteral orifice cannot be seen (Bazy).

tumor, smooth, firm, and covered with a healthy mucosa, in the ureteral zone. It can hardly be anything else.

Bazy has explained the formation of cystic dilatation, which he believes, ought to be designated a prolapse of the ureter in the bladder. According to this author, this affection is due to the existence of a stricture of the ureteral meatus; that is to say, from the pathogenic point of view, it seems that it may be a congenital lesion although the unfortunate symptoms in most instances do not become manifest until adult life.

If the ureter above the contracted ureteral meatus is subjected to violent contractions, prolapse might follow in the same manner as oc-

curs in prolapse of the rectum resulting from hemorrhoids. The effort made by the ureter to empty its contents on the one hand, and the difficulty of the passage of its contents through the contracted ureteral orifice on the other, constitute the predominating factor in the development of these cysts. If the contents are liquid, the chances of prolapse are small, but if the ureter is trying to expel a solid body like a blood clot or a calculus, the effort of expulsion is greater and the chances of prolapse will be correspondingly increased.

In certain cases the stone descending the ureter strikes against

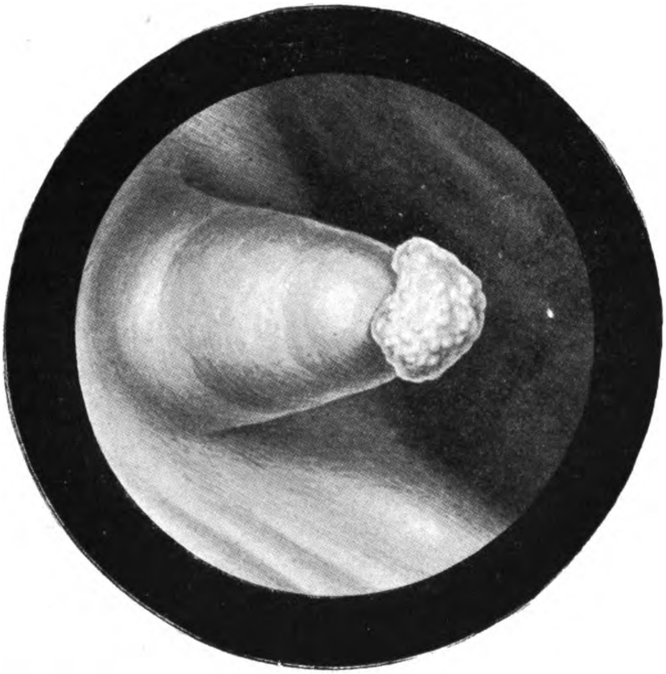

Fig. 100.—Prolapse of the ureter, with ureteral calculus, and capped by a secondary vesical calculus (Bazy).

the crest of the ureteric orifice. Little by little, as it increases in volume it pushes the ureteral walls backward and around it according to its development, and thereby determines the dimensions of the ureter and the cavity in which it is lodged. As Bazy has observed, it is not the cavity which controls the size of the calculus; the dilatation above is necessarily secondary to the existence and the development of calculus. Albarran has cited a case in which the simple pressure of the ureteral sound was sufficient to reduce the prolapse of the lower extremity of the ureter, which thus returned to the normal completely.

These cystic dilatations of the lower extremity of the ureter generally yield to surgical treatment, which should always be transvesical.

When the tumor is reached, it is opened freely, and the calculi removed, if there be any.

Anomalies in the mouth of the ureters are not rare; the two illus-

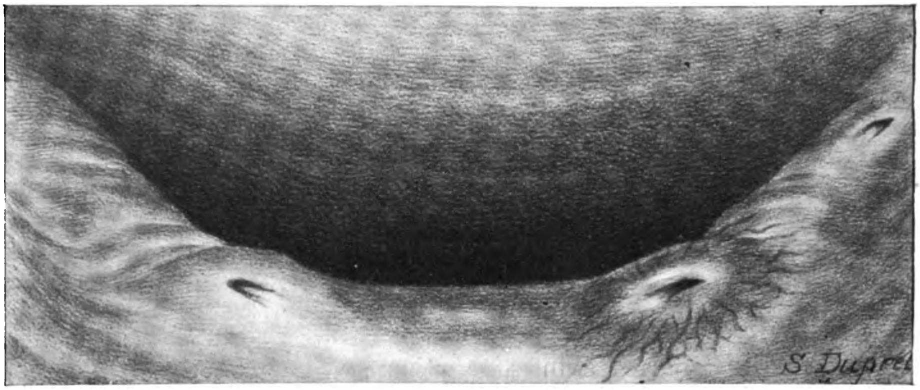

Fig. 101.—Anomaly of the ureteral orifices, drawn from nature. On the left, are two ureteral orifices; on the right, the ureteral orifice is normal.

trations which are here presented show rather interesting anomalies which I have myself observed. In one case (Fig. 101), there were three ureteral orifices. On the right side, the orifice was in its proper place

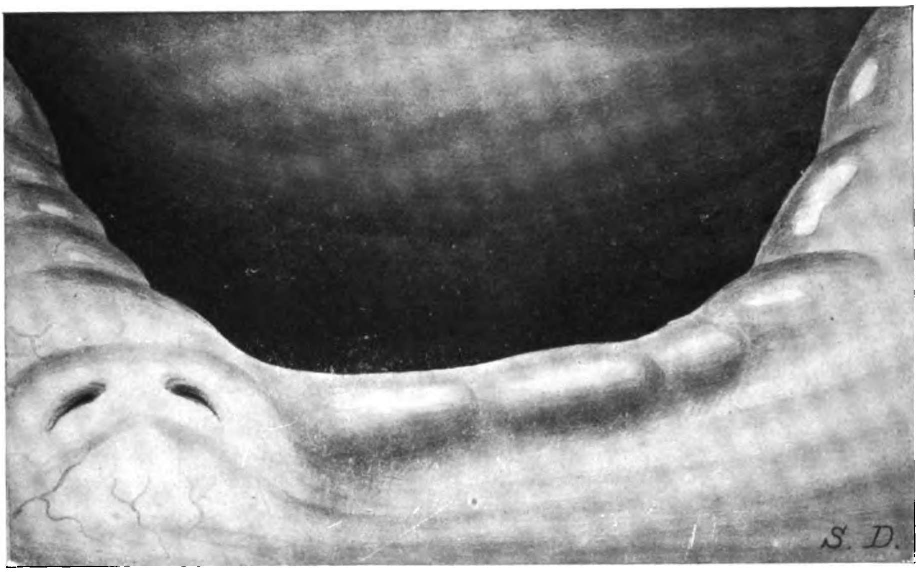

Fig. 102.—Anomaly of the ureteral orifices, drawn from nature. Two ureteral orifices, on the right side, none on the left.

and quite normal; but on the left, there were two ureteral orifices, one above the other, in the direction of the ureter. On the left side, mid-

way between the normal and the abnormal orifices, there was a short canal. The urinary stream did not traverse this short canal, and as a consequence, a stagnation of urine was brought about which resulted in the formation of pus in that portion of the canal, which was half closed. It was because of this purulent urine that the patient sought treatment.

In the second case (Fig. 102) there were two ureters, but they were both situated on the patient's right side. On the left side, there was no orifice whatever.

The ureteral orifice may be double; this is a rare anomaly, but it is met. Sometimes there are two ureters for a single kidney, which open into the bladder by two orifices. Occasionally while one of the two ureters opens normally, the other is closed and blind and constitutes a little cyst.

The orifice may be lacking altogether on one side; this is an indication that there exists but one kidney. Very rarely an extravesical termination of the ureter may also be observed; and lastly, the appearance of the ureteral orifice may sometimes reveal the exact diagnosis without further study. This occurs, for example, when a small stone has become impacted in the ureter or when a clot of blood or a parasite can be seen at the ureteral orifice.

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[4]Pasteau: Trans. VIIIe session Ass'n franç. d'Urologie, 1904, p. 602.

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Ureteral Ejaculation

Normally, ureteral emission is brought about in the following manner: The ureteral meatus begins by raising itself with effort, as if under the influence of a wave, animated by the contraction of the muscular fibers of the ureter. Next, the orifice opens slightly, giving passage to a jet of clear liquid. It remains open an instant and then contracts. When this emission is examined carefully, with an indirect cystoscope, and a view thus obtained through the water-filled bladder, it can be seen that the urine which is emitted from the ureteral orifice mixes with the vesical contents like a jet of glycerin would mix with

some water. After the ureteral emission, the orifice of the ureter closes and remains in complete rest until the next ejaculation takes place.

The emission is ordinarily repeated every twenty or thirty seconds, but the interval may be longer. When the emission is studied with the direct vision cystoscope held in profile, an actual little jet of water is seen which rises lightly above the orifice like a water spout and drops down upon the lateral surface of the orifice. This arrangement has been drawn after nature and shown well in Plate X, Fig. 6.

The ureteral emission may be more or less vigorous and accentuated. It is generally stronger in the case of a single kidney, as seen, for example, after nephrectomy. It is also more highly accentuated when the orifice is narrower. Indeed, when an examination is made in the air-filled bladder, with my direct vision cystoscope, a very fine whistling sound may be perceived at the moment of ureteral emission. I have been able to make this observation very clearly in a case where the lumen of the ureteral meatus was found considerably constricted as the result of a bloody ulceration of the right ureteral orifice. At the moment of emission, a kind of whining sound could be distinctly heard.

On the other hand, the ureteral emission may be absent. This indicates either that the corresponding kidney is not functionating or that the ureter has become obliterated. This phenomenon is observed during chloroform anesthesia, and it may also be met with in especially sensitive persons when a nervous spasm is produced.

In order to appreciate better the subject of ureteral emission in all its details, certain methods have been adopted; among these may be mentioned the subcutaneous injection of a sterile solution of methylene blue or better still, of indigo carmine. In this manner the ejaculation of the ureters can be observed with far greater precision. Certain authors employ indigo carmine injected a quarter of an hour before every cystoscopic examination. In this way, correct information concerning each ureter can be obtained immediately; and when it is known which kidney is affected and to be catheterized, immediate and exact data can thus be secured. This method, recommended by Voelcker and Joseph, gives excellent results. It is well to remember, however, that it consists essentially in making an intramuscular injection of 4 c.c. of a sterile 4 per cent solution of indigo carmine. In fifteen minutes the colored ureteral emissions can be seen with the cystoscope. When the kidneys are normal the emission resembles a puff of blue cigarette smoke. [When the indigo carmine is injected intravenously, the colored ejaculation is observed much more quickly.—EDITOR.]

Normally, after the injection of indigo carmine, when the kidney

PLATE IX

FIG. 1.—*Papillomatous tumor of the bladder* situated near the left ureteral orifice (before treatment).

FIG. 2.—*Appearance of the same tumor as above,* eight days after galvano-cauterization. All the villæ of the tumor have disappeared; nothing remains but a half burned stump, which readily disappeared under a second cauterization. When examined a year later, the patient showed no trace of recurrence.

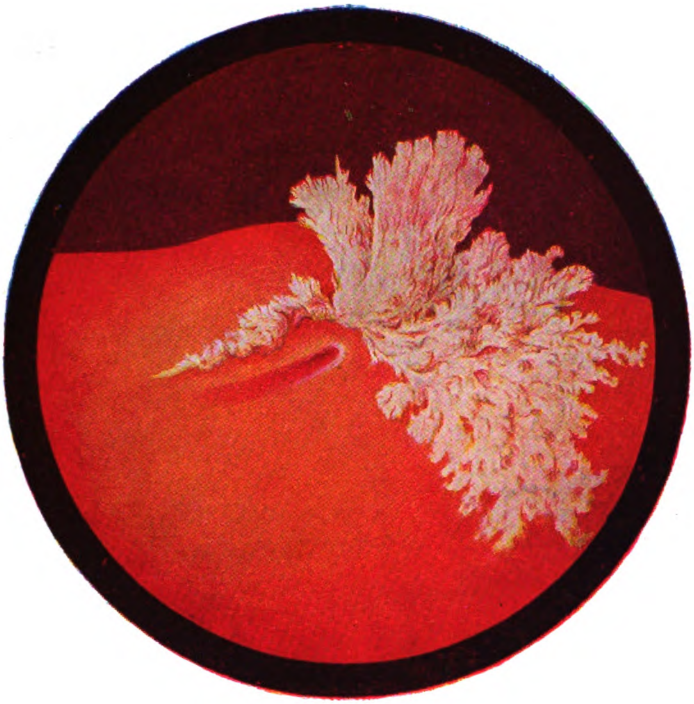

Fig. 1.

Fig. 2.

PLATE IX

is in good working order, the ureteral orifice is easily and clearly recognized. Indeed, the jet of strongly colored urine emanating from the ureteral orifice may be utilized as a useful guide in locating the orifices. This is especially valuable for beginners in cystoscopy. It should always be remembered that when a kidney does not functionate properly or is entirely lacking, or the ureter has become obliterated, the emission of blue urine does not, of course, take place. In these circumstances it would be impossible to establish the diagnosis by the aid of this method alone.

The ureteral emission may also contain blood. In order to under-

Fig. 103.—Ejaculation of thick pus, like a whirlpool, from a ureteral orifice (Nitze).

stand with what precision and clearness the diagnosis of renal hematuria may be made, it is necessary to observe a bloody ejaculation from a ureteral orifice in the midst of a clear bladder fluid, scattering itself like the smoke of a cigarette in the air. When the renal hematuria is marked, the condition may be compared with a factory chimney emitting smoke intermittently. Occasionally in addition to fresh blood, elongated worm-shaped blood clots may be seen emerging from the ureters. In these cases we should think of the possible existence of a renal neoplasm.

The ureteral emission may also contain pus; and it is always interesting whenever possible to note the manner in which the pus

emerges from the ureteral orifice. When, instead of having a real purulent emission like a whirlpool (Fig. 103) the pus dribbles out at long intervals like a drop of vaseline or as if coming out of a collapsible paint tube (Fig. 104), it may be concluded that the corresponding kidney is functionating very badly.

Fig. 104.—Ejaculation of pus from a ureteral orifice as from a tube of paint (Nitze).

Location of the Ureteral Orifices

The location of the ureteral orifices often has to be noted carefully when surgical intervention is required in the bladder. When, for example, there is a bladder tumor which is near the ureter, it is well to know the exact relations that this tumor bears with the ureteral orifice before undertaking surgical measures.

ERRORS IN CYSTOSCOPY

Though cystoscopy is a marvelous method of examination which it is impossible and even rash to ignore, it is, nevertheless, true as we have already stated, that the essential condition making for its usefulness is the proper interpretation of the pictures which it furnishes. The interpretation is of prime importance and this can not be acquired except by a large experience and considerable practice. There is no

doubt that errors may be made by beginners who have not overcome all the difficulties of this method even though they enjoy a familiarity with cystoscopy.

One of the errors that may be made is to mistake an extravesical tumor which elevates the vesical mucosa for a tumor of the bladder proper. The most simple case, as well as the most frequent, is that which is observed during pregnancy, when the bladder is raised by the gravid uterus. In the same way the bullous edema which is often met with in the fundus of the female bladder is sometimes due solely to the existence of a uterine cancer.

A second error which may be made is that of mistaking a chronic cystitis for a vesical tumor. Sometimes the cystitis takes on such proportions that it completely deforms the vesical mucosa. The latter occasionally presents real vegetations which simulate a real tumor of the bladder. The important point in the diagnosis is that the lesions are much more limited and circumscribed in the case of vesical tumors, while, on the contrary, they are in most instances diffuse and multiple in cystitis. Nevertheless, in certain cases one may be in doubt as to the correct diagnosis. I have found myself in similar circumstances, and the only method that has enabled me to establish a diagnosis was through biopsy. The reader is referred to the chapter on Vesical Biopsy for further details.

The differential diagnosis between a vesical tumor and a blood clot is sometimes very embarrassing. The best procedure consists in trying to move the mass by means of the cystoscope itself. The clot is mobile, it may possibly be broken up and does not bleed. The tumor on the other hand, does not possess these characteristics, but it has this special feature; namely, that it bleeds easily on the slightest contact.

Cystoscopic differential diagnosis between a benign tumor (papilloma) and a malignant tumor (cancer) is often very delicate, and as in the preceding instance, can not be decided at times except through biopsy; however, it is possible by a simple cystoscopic examination in the average case to establish definitely between a benign and a malignant tumor.

Papilloma is more frequent than cancer and appears usually in the form of a fringed tumor, floating, rose-colored and of a velvety raspberry-like appearance. It is especially characterized by the lightness of its outline. Vesical papillomata have long, fine, slender, and thin prolongations which extend far from the surface of implantation.

Cancer, to the contrary, is most often larger in size, with a more extensive implantation. Its appearance is rough; its base usually seems

much more fixed and more solid. Finally, in the vast majority of cases, the cancerous tumor presents eschars of blackish or grayish color. This opaque and dark coloring is not met with usually in benign tumors.

Calculus and tumor do not often present great difficulties in their differential diagnosis, except, however, in those cases in which the tumor is necrotic and encrusted with phosphates. Weitz reports a case of tumor encrusted with phosphates in which the error in diagnosis was possible even with the naked eye. Like a case reported by Dittel, this proved to be a tumor, which was removed by excision.

In the average case, a calculus is easily recognized by its mobility when touched with the cystoscope; a calculus never pulsates or beats like some tumors in the bladder; and lastly, when a calculus is touched with the cystoscope or a metallic searcher a typical resonance is heard as a result of the contact.

The diagnosis between a calculus and an accumulation of pus does not present any difficulty. However, I have had occasion to observe a pertinent case. The patient was suffering from retention of urine of medullary origin and was obliged to catheterize himself. Cystoscopy showed a large white mass in the fundus of the bladder which gave the impression of being a calculus, at first sight; but on touching it with the cystoscope, there was no sensation of contact with a hard substance and the whitish mass was easily broken up. Finally, a copious irrigation of the bladder brought forth large purulent masses, thus definitely determining the absence of a calculus.

Another error is that which mistakes a diverticulum of the bladder produced by the crossing of two vesical trabeculæ for a ureteral orifice. In this case the ureteral catheter makes the diagnosis by striking the vesical mucosa at the base of the diverticulum. However, when the ureteral meatus is very small and narrow (atresia), it is often quite difficult to say whether we are dealing with a strictured ureteral meatus or with a shallow diverticulum.

The diagnosis between an orifice of the ureter and a deep ulceration due to cystitis is often a delicate one. In cystitis, fissures or rhagades of the vesical mucosa are sometimes produced and between the lips of these fissures are seen more or less bloody orifices which might be mistaken for an inflamed ureteral orifice.

An error in diagnosis may result in the differentiation between a ureterocele or a cyst of the lower end of the ureter and a tumor of the bladder. An instance of this kind which has been observed is reported further on (see page 235). The same may be said as to the differential diagnosis between a varix of the bladder neck and a vegetating tumor at the neck. The point to remember is that bladder tumors at the neck

appear most often in the form of a glove finger, rather long and thick, whereas the varices are usually attached to the bladder mucosa and are immobile.

The diagnosis between a bladder tumor and an enlarged median lobe of the prostate is sometimes rather difficult, especially as these prostatic lobes are frequently pediculated, thus making the diagnosis quite complex.

Bearing in mind all the difficulties in diagnosis which have just been enumerated, it is essential to take every possible precaution against error; among these, the most important is to be familiar with all methods of examination and not to limit oneself to a single instrument or to a single method. We shall see in the following chapter that both indirect (prismatic) and direct vision cystoscopy should be of mutual assistance, and when one is found wanting, we must turn to the other. A combination of both of these methods assures a mathematically exact and absolutely perfect diagnosis.

DANGERS OF CYSTOSCOPY

When cystoscopy is practiced according to the rules which are described further on (pages 182 and 229) it is absolutely without any danger, and when carried out under favorable conditions, it is as easy as simple catheterization of the bladder. Nevertheless all the precautions that have been indicated should be taken, even to the minutest degree. The first of these precautions and the most important, in point of fact, is a most thorough asepsis. If this is neglected, complications may result, among which are the following:

1. **Infection.**—The cystoscope may become the source of a vesical infection exactly as any sound that is not aseptic when introduced. This infection makes itself apparent by the usual symptomatic triad, which is observed in cystitis,—pyuria, pollakiuria, and pain after urination.

2. **Burns of the Vesical Mucosa.**—Formerly when warm lamps were used, it frequently happened that little burns were produced when the lamps remained long enough in contact with a given point of the vesical mucosa; these burns appeared in the form of round spots resembling a more or less pronounced scar. I had the opportunity of observing similar burns some years ago, which had resulted from a cystoscopic examination which had been made some days previously by a colleague, with a lamp that was too hot. But today when the so-called cold lamps are employed universally, these accidents can not occur.

3. **Constitutional Symptoms.**—In performing cystoscopy in a case of severe cystitis, it is quite certain that complications may be induced, such as a rise in temperature and a severe constitutional reaction. Care should be taken to prevent the development of these complications.

4. **Electrical Disturbances.**—These constitute a rather disagreeable complication which I have observed twice, and which I could not at first explain. It sometimes happens that the cystoscope having been introduced properly, and the conducting wire or cable applied, the patient suffers a very painful electric shock as soon as the current is turned on, thus rendering the examination impossible. After many investigations, every possible fault of the instrument having been

Fig. 105.—Bladder phantom.

eliminated, I have been able to note that this happened only in cases in which the patient's prepuce was so long that it came in contact with the arms of the electric conducting rod, and that in these circumstances a short circuit was produced.

[In the editor's experience, this phenomenon has occurred even in patients who had no foreskins that might come in contact with the connecting wire. It has been observed that a moist cement or wooden floor acts as conductor of the current, and if the patient places his hands on the sides of the iron table, he thus completes the circuit and produces the shock. This can be avoided by placing a thick rubber matting or sheeting under the legs of the table, thus insulating it; the operator's stool should also be similarly insulated. It goes without

saying that the patient shall likewise lie on a rubber sheet spread over the table.—EDITOR.]

The dangers that may fóllow catheterization of the ureters, such as infection and perforation, are discussed further on (see page 293).

Vesical Phantoms.—In order to learn cystoscopy, beginners will often find it to their advantage to use phantoms which give a picture similar to that of the interior of the bladder. These phantoms are usually made of rubber, and their interior is painted to represent the base of the bladder with the ureteral orifices and the interureteral ligament. Numerous models may be had, the most practical being those that approach reality as nearly as possible. These are filled with water and provided with syphons that end at the imaginary ureteral orifices. The latter are surmounted with two bottles which represent the ureters and kidneys. The most commonly used phantoms are the models made by Janet, Frank, Eitze, Viertel, and Wossidlo.

An economic way to secure a phantom is to make one: Take a common rubber balloon or football of small size, the ordinary child's toy. Make a central anterior opening to represent the urethra, through which the urethroscope is introduced; make two little side openings, placed symmetrically, to represent the ureteral orifices. This balloon is attached to a little board, and thus provides means of exercise at small expense, in the beginnings of cystoscopy. By cutting this balloon horizontally in its greatest diameter, the desired image may be drawn or painted in its lower segment and thus studied through the cystoscope. The beginner thus learns how to interpret cystoscopic pictures, this being the greatest difficulty in the practice of cystoscopy. This practice is especially useful in prismatic cystoscopy for the images are considerably displaced and deformed, varying according to the distance at which the prism is held, and so forth. With these vesical phantoms the beginner will acquire a certain degree of experience and digital skill which is so essential in the practice of cystoscopy in the living subject.

CHAPTER V

PRISMATIC (INDIRECT) CYSTOSCOPY

The indirect vision cystoscope is essentially an instrument for vesical exploration. At the present day, its use is general for the examination of the walls of the bladder, and its indications are many and varied.

Nitze's Prismatic Cystoscope.—The prismatic cystoscope of Nitze and those which are derived from it are today the instruments most commonly used in the examination of the vesical cavity. Nitze's instrument consists of a metallic catheter with one extremity bent like a crutch (Fig. 106). Its caliber corresponds to No. 21 Charrière, and its length is 20 centimeters. The crutch-like extremity bears a little electric lamp designed to light up the parts corresponding to the concavity of the instrument. These lamps are highly perfected and are perfectly cold when lighted, at least when new.

Of the two wires that bring the current to the lamp, one is insulated in its entire length in the wall of the instrument; the other is connected with the metallic wall itself. The current is brought to the instrument by means of a pair of arms in the form of a double fork which is applied by simple contact to two rings attached to the neck of the cystoscope. Because of this arrangement the cystoscope may be turned in all directions without interrupting the electric current. The eyepiece of the cystoscope presents a little immovable button which constantly informs the observer as to the exact position of the prism.

The body of the cystoscope is straight and its extremity is bent, as already stated, like a crutch. At the elbow thus formed, is a reflecting prism, upon which are reflected the images of those portions of the bladder which are illuminated by the electric lamp. In the body or shaft is a series of lenses which magnify the image; these lenses make up the optical system of Nitze.

Nitze's Optical System.—This consists of three sets of lenses. At the vesical extremity is a compound lens generally called the "objective." This furnishes a real, inverted image. As this image is very small, being formed at a close distance and backward, it would be impossible to see it with the naked eye. That is why a second lens is placed behind it near the middle of the shaft or body of the cystoscope;

the image is thus brought from the vesical extremity of the tube to its exterior extremity quite close to the so-called "ocular." The latter acts only as a strong magnifying glass, that is to say, it enlarges the direct image already obtained.

To recapitulate: Three lenses constitute the optical system of

Fig. 106.—Nitze's cystoscope.

Nitze; one situated at the vesical extremity, the "objective;" the second situated at the middle of the body or shaft, and the third is the "ocular."

To this optical system is added a rectangular prism, which is placed in front of the objective. This prism is arranged so that one of

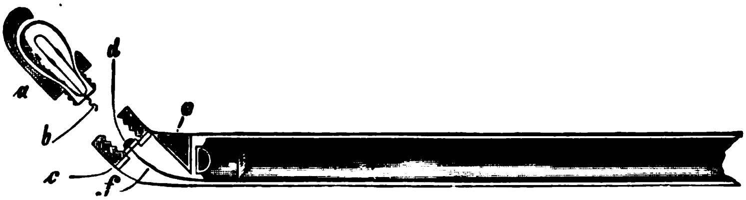

Fig. 107.—Sectional view of Nitze's cystoscope (Nitze). *a*, metallic capsule which holds the lamp; *b*, contact wire of the lamp terminating in a fine spiral; *c*, metallic part into which the lamp is screwed; *d*, fine insulated platinum plate, which makes the contact with the spiral wire, *b*; *e*, lens.

its surfaces is perpendicular to and the other parallel with the longitudinal axis of the instrument, with which the hypothenuse of the rectangular prism must form an angle of 45 degrees. The hypothenuse presents a mirror which sends back the luminous rays that enter through the lateral window of the instrument.

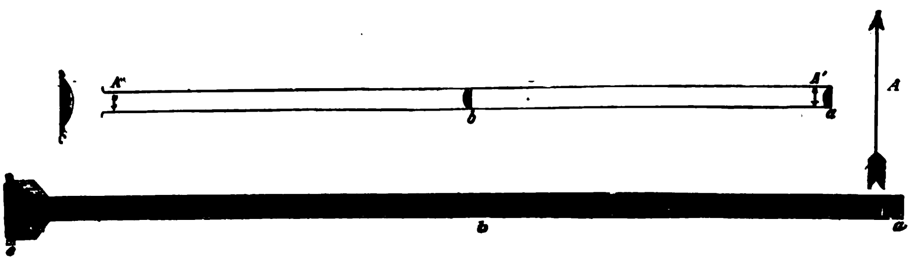

Fig. 108.—Optical system of Nitze's cystoscope.

The effect of this prism is to displace the visual plane to the extent of 90 degrees. It is because of this prism that the images obtained present varied irregularities, alterations and displacements which do not give an entirely exact idea of the real appearance of the objects

examined. All objects placed vertically are seen in the horizontal plane, and on the other hand, what is really horizontal becomes vertical. Moreover what is in front is seen behind, in the cystoscopic picture, and objects that are located superiorly are seen inferiorly, and reciprocally, in the visual field. On the other hand, objects situated on the right or left side are seen on the corresponding side.

In addition to the optical system and the prism, the cystoscope presents a lamp placed in front of the prism at the "beak," which is joined to the shaft or tube at an obtuse angle based on the so-called "Mercier's crutch curve." At the ocular end of the cystoscope are two metallic rings isolated one from the other, one of which is soldered to the metal of the instrument itself. The other is attached to the conducting wire which penetrates into the interior of the shaft by a special groove.

The Cystoscopic Lamp.—The lamp is situated at the beak, and

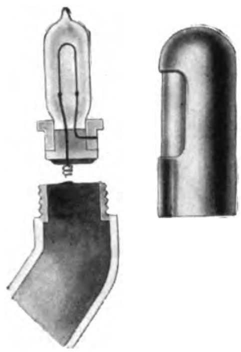

Fig. 109.—Cystoscope lamp and its mounting.

hooded in a metallic cap. Its free extremity constitutes the beak of the instrument, while the other end presents a screw by means of which the lamp is attached to the shaft of the instrument. One of the poles which serve to bring the current to the lamp is directly in contact with the metallic hood which partially covers the lamp. The other is rolled up in a fine spiral and brought into contact with the interior conducting wire which is placed in the shaft of the instrument and which it follows in its entire length. At this point the current frequently fails because of poor contact, and it is well to remember that the condition of this little spiral must be investigated when a lamp will not burn. By lengthening this spiral with a pair of forceps, a better contact is obtained. The greatest gentleness must be employed, for the spiral is extremely fragile and breaks easily.

The filaments of the lamp were formerly made of carbon, but they had the disadvantage of generating a great deal of heat. At the

present time, with the use of metallic filaments a much more intense illumination is obtained and the lamps are almost always cold; they become warm only after prolonged use (Fig. 109).

Rotating Contact.—The current is carried into the interior of the cystoscope by means of a special rotating contact (pincers) in the shape of a fork with two branches separated one from the other (Fig. 110). These branches are connected with the contact rings of the cystoscope. In the center of the fork is a small slide by means of which

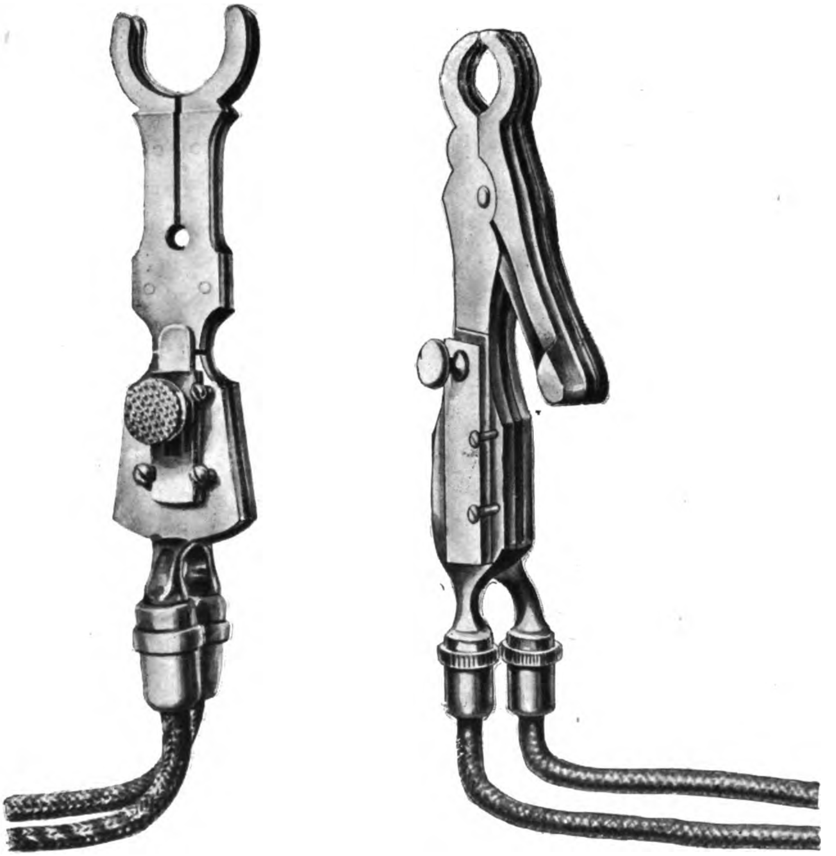

Fig. 110.—Ordinary attachment of the indirect cystoscope.

Fig. 111.—E. Frank's improved attachment for the indirect cystoscope.

the current may be turned on or off at will. This rotating contact works very well when in good condition, but if not properly cared for, i. e., permitted to get dirty or rusty, a poor contact results.

Frank, of Berlin, has modified this pair of pincers in the following manner: Instead of having it end in a double fork, the parts move in a semicircle which is narrowed or widened by the aid of a flat ivory bolt so that it can seize the cystoscope firmly, yet allowing the latter to turn

easily in its grip. Variations and interruptions which are so annoying during an examination are avoided with this instrument (Fig. 111).

Such was the original cystoscope of Nitze, the appearance of which soon afterward gave rise to many improvements. Disregarding for the moment those changes which aimed at perfecting ureteral catheterization, or the treatment of vesical tumors or of foreign bodies in the bladder, we shall consider in this chapter only those improvements which gave a better view of the vesical walls. A full consideration of these many improvements would occupy many chapters, but we shall study them briefly:

1. Modifications for obtaining a direct view of objects.
2. Modifications for magnification of images and enlargement of the visual field.
3. Modifications for irrigating the bladder.
4. Modification for securing a view of the bladder neck.
5. Modification for securing binocular vision.

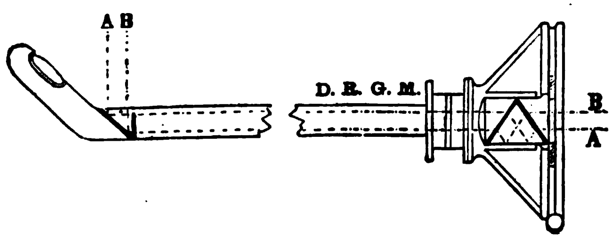

Fig. 112.—Course of the light rays in the Nitze-Frank cystoscope.

6. Modification for securing rectification of cystoscopic images.
7. Modification for endovesical photography.
8. Modification for ureteral catheterization.
9. Modification for endovesical operations.
10. The pancystoscope of Baer.

1. **Modifications for Obtaining a Direct View of Objects.**—The first experiments made with the object of correcting the deformities produced by the cystoscope, were made by Weinberg, in 1906, and by Frank, in 1907. In 1906 the former devised his "orthokystoscop," in which the correcting lens was placed, not in the shaft of the instrument, but in a separate mounting affixed to the ocular. But this instrument only permitted the examination of a part of the base of the bladder and of the nearest portion of its circumference.

Ernest Frank's cystoscope which appeared in 1907[1] is characterized essentially by the presence in the optical apparatus of a second

prism, which corrects the inverted image in the first prism (Figs. 113 and 114). This corrective optical system may be adapted to all cystoscopes in the form of a movable mounting adapted to the ocular so that

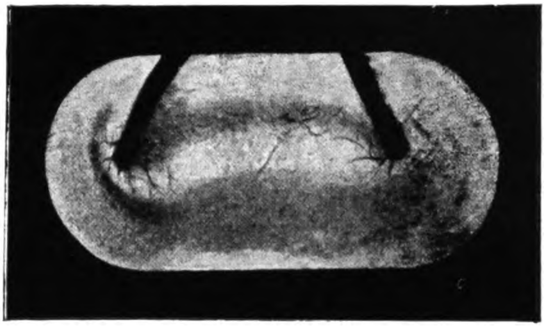

Fig. 113.—Cystoscopic image in the early cystoscopes (inverted).

neither the outer appearance of the instrument nor the customary manner of use need be modified in the least degree. With this cysto-

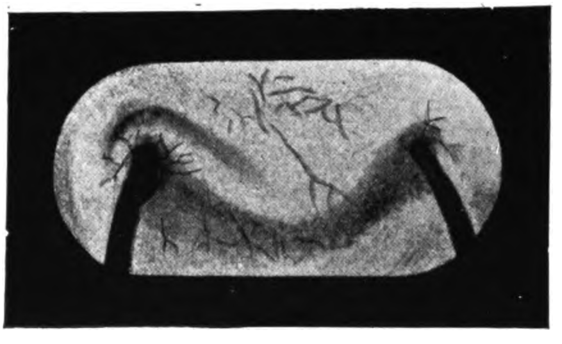

Fig. 114.—Cystoscopic image corrected in Frank's new cystoscope. Double catheterization of the ureters.

scope the real appearance of the entire bladder can be studied without inversion of the image, and besides, the illumination is very bright.

2. **Modifications for Magnifying the Image.**—In 1909, Otto Ring-

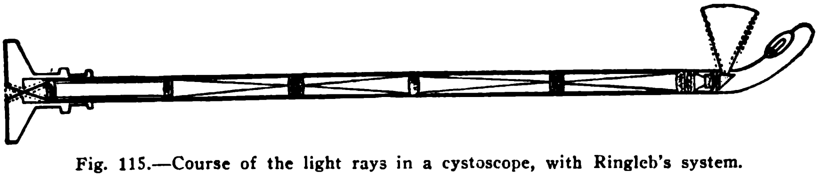

Fig. 115.—Course of the light rays in a cystoscope, with Ringleb's system.

leb, of Berlin, devised a special optical system constructed on the type of the telescope (Fig. 115); this instrument should properly be ranged with microscopes of the immersion type and with slight magnification.

This optical system corrects the inverted image and obtains this result by means of two corrective arrangements combined with a prism in the form of Amici's "roof" or "garret" (Fig. 116). Through this arrangement, erect and true pictures are obtained. Ringleb's cystoscope has a large visual field and produces cystoscopic pictures of great clarity. Unfortunately this instrument, which is very expensive, finds its greatest utility when it is desired to make a minute examination of the details of a given point in the bladder. Quoting Hogge, of Liege, "as compared with the analogous instrument of Nitze, the visual field is smaller, but what is seen, is seen admirably."

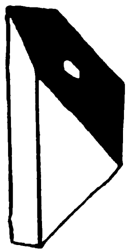

Fig. 116.—Amici's prism, in the form of a housetop.

The cystoscope of William Otis, of New York, was devised in order to obtain a large visual field. In this instrument the prism is replaced by a hemispherical lens the flat surface of which is silvered. The substitution of this hemispherical lens is equivalent to the addition of two planoconvex lenses; of the latter, the lens occupying the upper portion of the prism assembles the rays at a large angle and brings them together on the hypothenuse; the other on the anterior surface of the prism, corresponds to the first lens in the telescope. Otis obtained a visual field four times greater than that obtained with any other rectangular cystoscope; in addition, the picture is also very clear.

3. **Modifications for Bladder Irrigation.**—It being absolutely necessary that the bladder contents shall be perfectly transparent in order to practice cystoscopy, and since the presence of pus or blood may

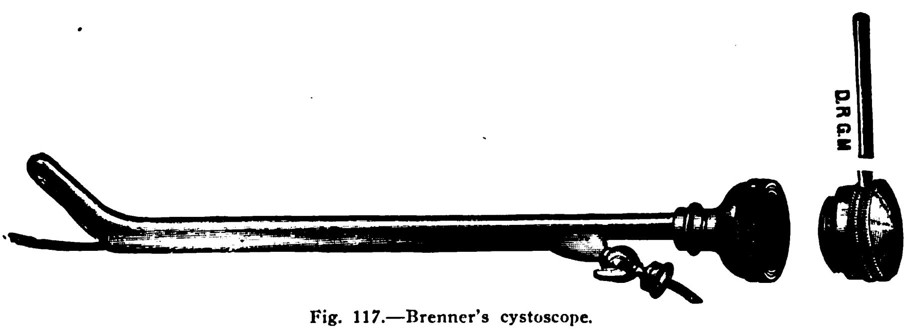

Fig. 117.—Brenner's cystoscope.

cloud the bladder fluid, many efforts have been made to remedy this inconvenience. Many authors have devised instruments with the object of permitting bladder irrigation during the cystoscopic examination.

Brenner's Cystoscope.—Brenner's was the first cystoscope (Fig. 117) in which the visual field and the lamp were situated on the convex-

ity of the beak. This instrument was provided with a small tube on its convex side for the irrigation of the bladder during the cystoscopic examination. In addition, this canal although of fine caliber was intended to afford facility for the passage of a ureteral catheter.

MEGALOSCOPE OF BOISSEAU DU ROCHER.—This author[2] devised a cystoscope which he called a "megaloscope." It was composed of two separate parts. One consisted of a hollow catheter of No. 23 Charrière caliber, elbowed near its extremity and provided at this point with a very small electric lamp; the second, or optical portion, which slipped into and penetrated the first, comprised a tube which contained lenses and a prism. The latter was arranged in such a manner that it fitted into a window prepared for this purpose, in the hollow catheter just mentioned. When the first portion was introduced into the bladder, without the optical portion, vesical irrigation was possible as with an ordinary catheter. Later, Boisseau du Rocher[3] added two little irrigation tubes to the convex portion of his instrument which serve to irrigate the bladder during the examination and also facilitate the passage of ureteral catheters.

GUTERBROCK'S CYSTOSCOPE.—This author's[4] instrument strongly resembles the megaloscope of Boisseau du Rocher. As in the preceding, the catheter and the optical apparatus are independent of each other, which facilitates bladder irrigation during the examination when the optical portion is removed. The catheter, slightly elbowed at its vesical extremity, was pierced by two orifices through which the bladder was irrigated. In the interior of this catheter a tube bearing the lamp, the prism, and the optical system, was inserted. The lamp and the prism were thus placed exactly at the opening in the catheter.

FENWICK'S CYSTOSCOPE.—This instrument, based on the same principle as Guterbrock's, is an improvement on the latter. It is likewise composed of two distinct parts. The hollow sound differs from the preceding instrument in that it bears only one large orifice (instead of two), thus permitting bladder irrigation. During the examination, the lamp and prism are brought to this point and maintained there. The cystoscope of Kollmann, of Leipzig, is also constructed according to these principles.

All of these instruments come under the category of irrigating cystoscopes, of which every urologist ought to possess at least one model, for they are indispensable in very many circumstances. They may be referred to a model type which consists of a hollow sound, elbowed in the form of a crutch, with an opening near the elbow through which water may be introduced into the bladder and withdrawn at will.

PLATE X

FIG. 1.—*Normal appearance of the bladder neck* as seen with the direct vision cystoscope. The first ring represents the end of the urethra; the dark central portion represents the darkened base of the bladder.

FIG. 2.—*Cicatrix of a vesical perforation* due to the rupture of an abscess in the vicinity of the bladder.

FIG. 3.—*Large papillomatous tumors* of the bladder neck.

FIG. 4.—*Application of the galvanocautery to the tumor* at the lower part of the bladder neck (compare this with Fig. 3).

FIG. 5.—*Appearance of a normal ureteral orifice.*

FIG. 6.—*Normal emission of the right ureter* as seen with the direct vision cystoscope. In this case, the cystoscopic tube is held in profile, and not in full view. The urine is thus observed leaving the ureter in the form of a little jet of water.

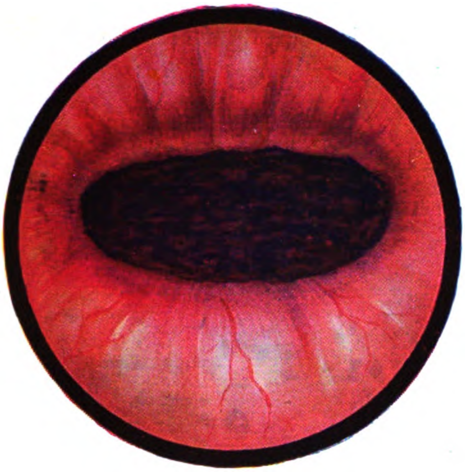

Fig. 1.

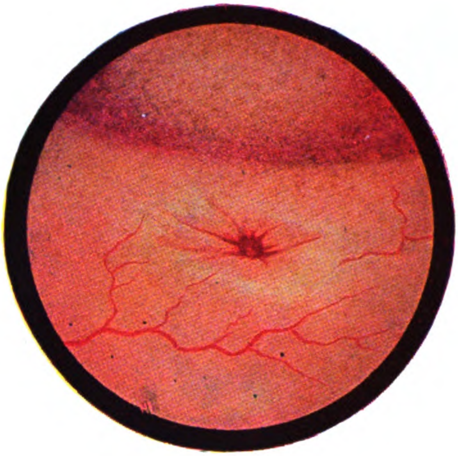

Fig. 2.

Fig. 3.

Fig. 4.

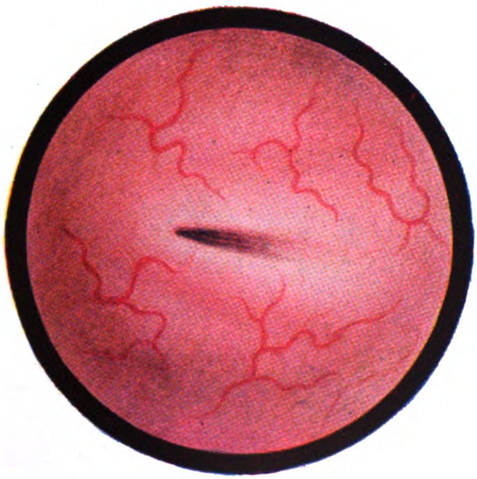

Fig. 5.

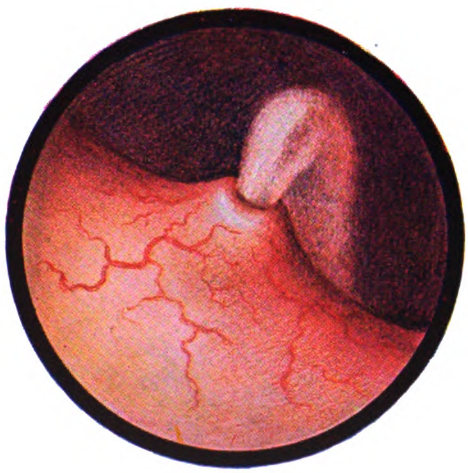

Fig. 6.

PLATE X

In the interior of this hollow sound an obturator is inserted, carrying a prism and optical system. In order that the optical obturator (telescope) may be introduced while the bladder is full of water, a bolt with an automatic valve is provided (Fig. 118).

Irrigating cystoscopes often render the greatest service, particularly in the examination of a tumor of the bladder which bleeds freely; the hemorrhage thus produced in these cases would otherwise make a clear view impossible. The technic employed with the irrigating cystoscope is as follows: The bladder is cleansed through an ordinary catheter, with warm boric solution. The cystoscope is introduced and an effort is made to see clearly. If the vesical region is found obscured by the presence of pus or blood, the optical piece in the interior of the tube is withdrawn and a little rubber joint mounted on a metallic piece is inserted in its place, which permits temporary occlusion of this tube. The unclean fluid is allowed to run out and clear fluid is injected to re-

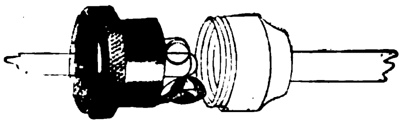

Fig. 118.—Automatic valve, in irrigating cystoscopes, which can be opened for the insertion of the optical part, and when this is withdrawn, it closes automatically, thus preventing the escape of the bladder fluid.

place it. The metallic piece is now removed, the optical system (telescope) is reintroduced and the examination is continued.

This arrangement has notable advantages, especially when we are dealing with prostatic lesions or with a congested prostate which bleeds on contact with the instrument. Furthermore, once the prostate has been passed, there is no further bleeding after the instrument has entered the bladder. Unfortunately, in spite of these really important improvements, it is, nevertheless, true that in a great many cases renal or vesical bleeding prevents a clear view with the prismatic cystoscope; in these instances, direct vision cystoscopy must be resorted to.

4. Improvements for Viewing the Bladder Neck.—

NITZE'S VESICAL CYSTOSCOPE NO. 3.—In order to obtain a view of the vesical neck, Nitze devised a special model with a modified elbow which he called "cystoscope No. 3;" with this instrument the vesical neck could be seen easily.

SCHLAGINTWEIT'S CYSTOSCOPE.—This author[5] later solved the difficult problem of obtaining a direct view of the bladder neck by adopt-

ing a movable prism controlled from without (Fig. 119). By means of a special mechanism the prism can be projected forward and thus a retrograde view of the bladder neck can be obtained. Through a very simple maneuver the prism is made to return to its original position. Thus this instrument may serve not alone for the inspection of the

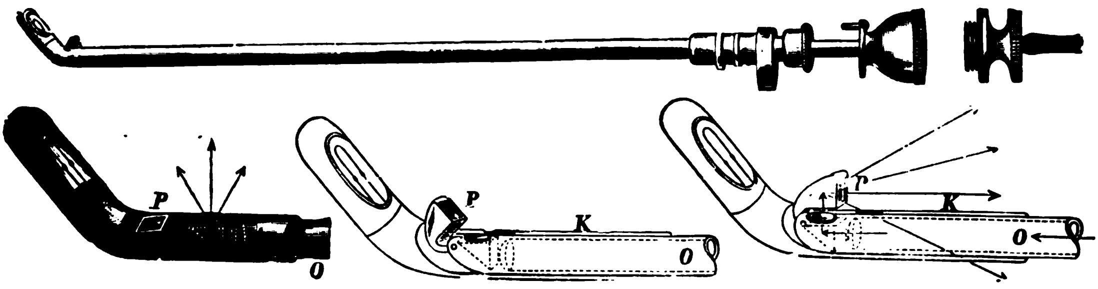

Fig. 119.—Schlagintweit's cystoscope.

vesical neck, but also for the examination of the entire bladder like a cystoscope with the ordinary prism.

5. **Improvements for Securing Binocular Vision.**—In order to obtain a view of an object situated in the bladder with both eyes and thus

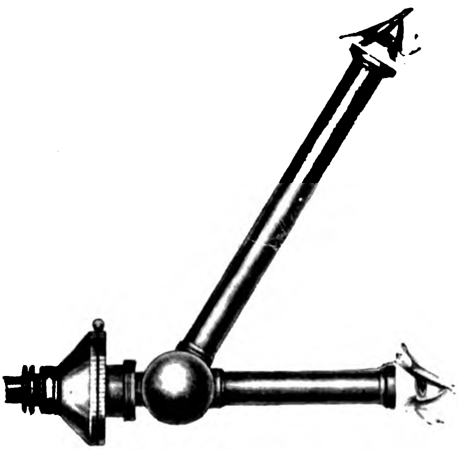

Fig. 120.—Kutner's demonstration cystoscope.

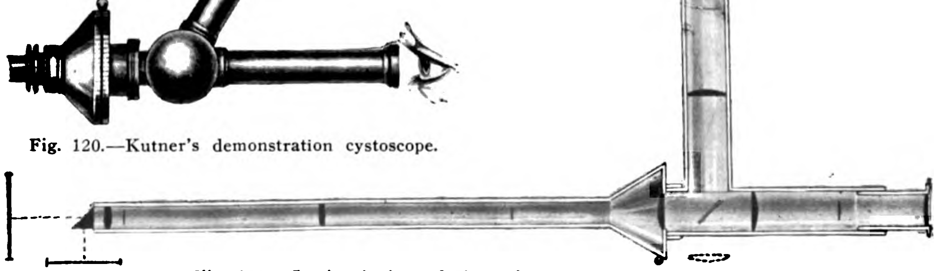

Fig. 121.—Sectional view of Kutner's cystoscope.

secure the relief furnished by binocular vision, Jacoby,[6] of Berlin, devised a stereocystoscope through which the bladder can be seen with both eyes. This method of examination greatly facilitates the proper interpretation of the images, especially for beginners.

Kutner's Demonstration Apparatus.—In order to permit two observers to examine the bladder simultaneously, Kutner devised an apparatus which may be adapted to the cystoscope (Figs. 120 and 121). This apparatus consists of a bifurcated tube which is attached to the ocular of the cystoscope. At the point of intersection of the axis of the long and short tubes, a little transparent mirror is inclined at an angle of 30 degrees with the axis of the tube. The mirror divides the luminous rays into two parts. One portion traverses the mirror and finally strikes the optical apparatus of the short tube; the other is reflected by the mirror into the long tube. The images seen by both observers are comparatively clear and clean-cut.

6. **Modifications for Rectification of the Image.**—

Jacoby's Corrective Mounting.—During the cystoscopic examination, the images perceived are invariably considerably displaced as

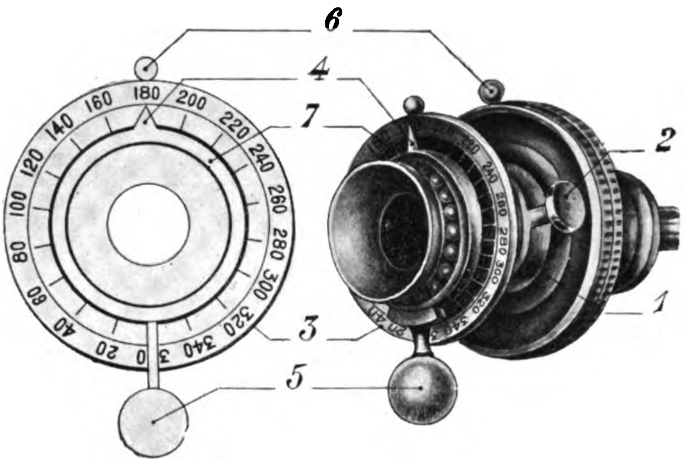

Fig. 122.—Jacoby's corrective mounting.

compared with the real position of the objects themselves. In order to obviate this condition, Jacoby devised a corrective apparatus (Fig. 122) by means of which the real position of the objects in the cystoscopic picture can be determined. This apparatus is attached by means of a screw in front of the ocular of the cystoscopes ordinarily used. It consists of a rotary prism which is easily turned, a vertical dial which oscillates on a circular disc divided into degrees and another situated behind the dial and provided with a button. By rotating the corrective prism the exact situation of objects is easily found with this apparatus.

7. **Modifications for Endovesical Photography.**—The beautiful pictures seen with the cystoscope long ago inspired attempts at photography for permanent record. The first photographic attempts made

by Antal, at Budapest, and by Kutner, were not satisfactory. Nitze[7] perfected the method and obtained highly satisfactory results. Important improvements were subsequently made by Hirschmann, and later by Berger.[8] One of the most practical methods of photography is that of Kollmann, of Leipzig (Fig. 123). Jacoby, of Berlin, subsequently perfected a stereocystograph, with which stereoscopic images of objects situated in the bladder can be obtained.

8. **Modifications for Ureteral Catheterization.**—The modifications having this object in view are fully described in a later chapter.

9. **Modifications for Endovesical Operations.**—These changes are also described later (See Treatment of Bladder Tumors).

10. **Baer's Pancystoscope.**—Baer, of Wiesbaden, comprised the principal modern improvements contributed to cystoscopy in one instrument which he named the "universal instrument" or "pancystoscope." It consists of a tube in which the movable optical portion of the various cystoscopes is inserted. With this instrument it is a simple

Fig. 123.—Kollmann's photographic cystoscope.

matter to substitute one optical system for another or to introduce into the tube a series of instruments, such as catheters for the bladder and ureters, galvanocautery handles, forceps, curettes, etc.

This instrument has very distinct advantages, for it makes possible the use of ureteral catheters of rather large caliber, No. 9, Charrière, for example. It also enjoys all the advantages of the irrigating cystoscope. Lastly it makes endovesical operations possible. Unfortunately, it is really not very practical, because it is too complicated and deteriorates easily.

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[6]Jacoby: Le Stereocystoscope, Ann. génito-urin., March 1, 1906, p. 359.
[7]Nitze: Kystophotographischer Atlas, Wiesbaden, 1894.
[8]Berger: Notice sur la photographie de la vessie, Ann. génito-urin., 1900, p. 414.

TECHNIC OF INDIRECT VISION (PRISMATIC) CYSTOSCOPY

Sterilization of the Cystoscope.—The prismatic cystoscope should be sterilized in a formalin sterilizer, of which I have described[1] one of the most simple and practical types (Fig. 124). This apparatus consists of a simple tube of large caliber, open at both ends, and carrying at each end a metallic furrow, upon which is screwed a perforated

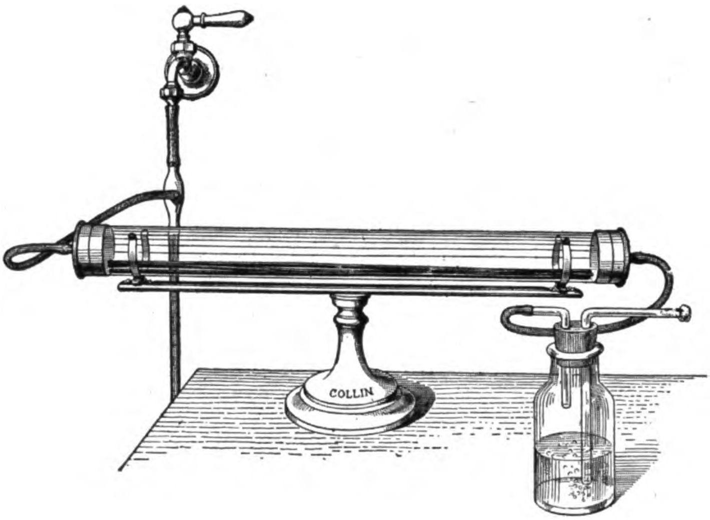

Fig. 124.—Formaldehyde sterilizer.

metallic stopper provided with a ferule. At one extremity a rubber tube is fastened, which connects the glass tube to a bottle filled with pure formol; at the other extremity is a rubber tube in direct connection with a water spigot.

This apparatus is extremely simple. By opening the water tap, a vacuum is created in the sterilizing tube which takes up the air that comes bubbling up into the formol and becomes charged with formaldehyde vapor. This vapor, constantly fresh and continually renewed, completely sterilizes the instruments contained in the interior of the tube in fifteen minutes.

The great advantage of this principle of sterilization, which was devised by Suarez de Mendoza, of Madrid,[2] is that in addition to its

complete security from the point of view of disinfection, it is absolutely harmless to the instruments, however delicate they may be. It is indeed well known that when prismatic cystoscopes are allowed to remain in a trioxymethylene (paraform) sterilizer, the optical portion undergoes changes which render them unfit for service. With this apparatus, to the contrary, instruments never undergo the slightest change as a result of the sterilization; this is accomplished, as above mentioned, in fifteen minutes.

Cystoscopy is best performed in a darkened room. The cystoscopic pictures will thus be found much clearer and brighter.

Preparation of the Cystoscope.—The instrument should be tried before it is sterilized and the operator should be certain that all its parts are in good condition.

1. Testing the Optical Apparatus.—The visual field of the instrument should be very clear and should give exact and precise images. The prism and the ocular should be in perfect condition and their surfaces brilliant and dry. The outer surface of the prism or of the lens is occasionally affected by moisture. When this is only on the outside, it is easily remedied by cleaning the glass with a fine cloth or with chamois. When, however, the moisture has penetrated into the interior of the cystoscope, and has reached the inner lens, the cystoscope must be repaired so that perfect clarity of the lenses and prism may be assured.

In cystoscopes with a movable optical system, the latter possibly may not correspond exactly with the window of the instrument into which it is inserted. This verification should be made before the cystoscope is used.

2. Testing the Electric Current.—The lamp should give a good white light. The intensity of the current should be increased until it is no longer possible to distinguish the handle of the metallic filament in the single mass of light. When the lamp does not light up, the cause should be sought; first, at the source of the current, next, at the conducting wires, and then at the rotating contact of the cystoscope. At the last mentioned point, there are two especially delicate places. One is the interrupter, where the groove or slide may be somewhat loosened, thus preventing the transmission of the current. The interrupter may be dirty or rusty or perhaps some dust has slipped under it. These parts must be cleaned scrupulously. When the current does not pass, a little pressure on the interrupter will produce an illumination, which ceases as soon as the pressure is released.

The second cause of interruption of the current at the rotating contact is found when the conducting wires at this point are loosened

or broken. Short interruptions of the current are produced which result in a flickering of the light, thus making the examination extremely annoying. At the least movement the lamp goes out, only to become relighted immediately, and it is utterly impossible to make a satisfactory examination in these circumstances. A poor contact between the arms of the contact and the rings of the cystoscope, may also produce this condition. These troubles are best avoided by keeping the instrument and its attachments in a state of perfect cleanliness and repair.

The interior conducting wires also should be tested and verified; likewise, the lamp itself, by loosening the lamp, and bringing it in contact with the two branches of the contact. If this is in good condition,

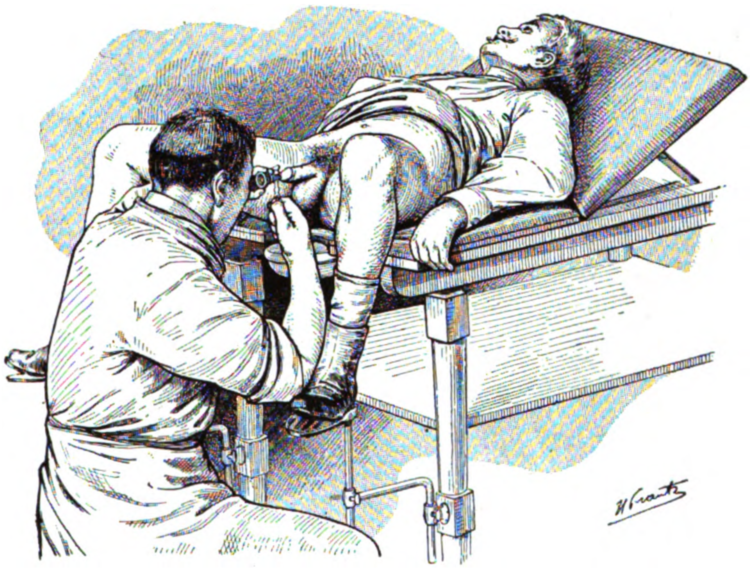

Fig. 125.—Indirect (prismatic) cystoscopy; position of operator and patient.

illumination should result immediately. It is also well to assure oneself that the lamp is quite cold, and will not burn the vesical mucosa.

Preparation of the Patient.—All the clothing but his shirts should be removed; he should lie on his back, the knees bent and wide apart, the feet resting on stirrups, the buttocks slightly raised and brought to the edge of the examination table.

Before the examination, the operator should have made certain that the urethra is permeable with an olivary bougie, No. 23. If strictures are present, they should be dilated before anything further is done. The bladder should have a capacity of at least 80 c.c., and even with this minimum capacity, vision is almost always difficult. It is a

well-established principle, therefore, not to attempt cystoscopy in an inflamed bladder without having submitted it previously to appropriate treatment so as to increase its capacity.

When an immediate examination is necessary, it will be well to diminish the sensitiveness of the bladder by instilling into it two grams of antipyrin and ten to twelve drops of laudanum half an hour before the examination. Local anesthesia obtained by the use of a sterile 1 per cent solution of stovaine in the bladder, will also be useful, but one should not depend too much on its effect. As a last resort general chloroform anesthesia may have to be employed.

Finally, the vesical medium must be transparent. Copious irrigation with tepid boric solution until it returns perfectly clear will bring this about.

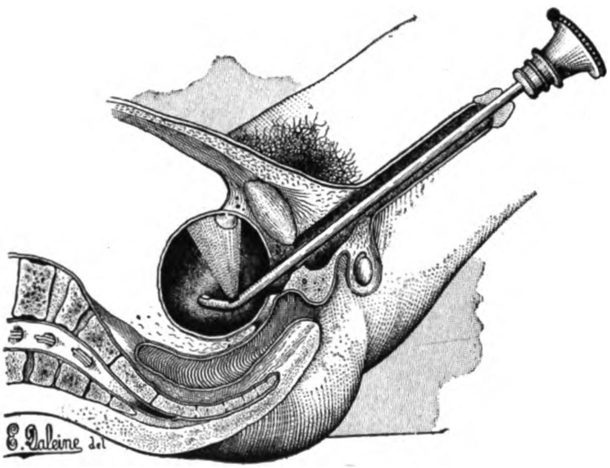

Fig. 126.—Application of the indirect cystoscope (Nitze).

In hematuria of vesical origin, irrigation with hot boric solution often stops the bleeding long enough for the examination to be made. In more obstinate cases, recourse may be necessary to a 5 per cent solution of antipyrin of which 40 to 60 grams are instilled into the bladder and allowed to act on the vesical mucosa for some minutes before the examination. Two or three instillations of the following solution may be made, taking the precaution not to let it remain in the bladder longer than a few minutes:

Antipyrin	40 gm.
1:1000 solution of adrenalin	100 drops
Distilled water	1,000 gm.

Occasionally it will be necessary to use the irrigating cystoscope and to renew the bladder fluid several times during the examination.

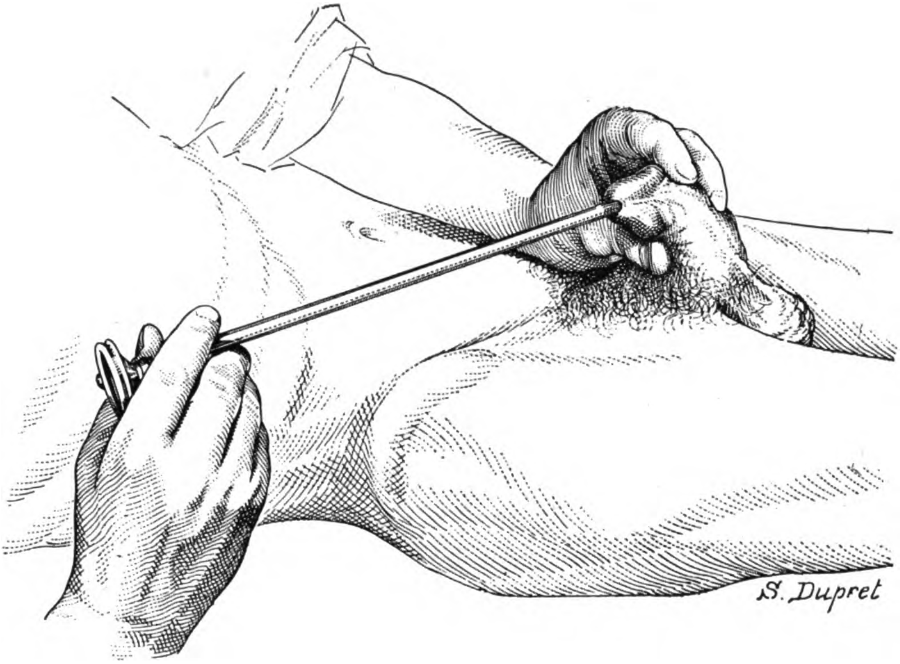

Fig. 127.—First step in the introduction of the indirect cystoscope. The instrument is inserted into the urethra parallel to the inguinal fold.

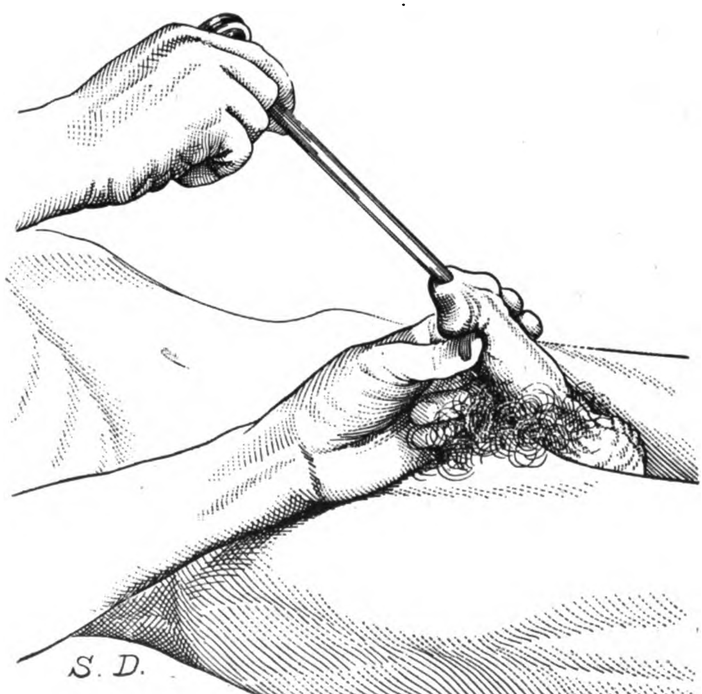

Fig. 128.—Second step in the introduction of the indirect cystoscope. The instrument and the penis are held in a plane perpendicular to the axis of the pelvis.

Technic.—The operator begins by filling the bladder with warm boric solution or simply sterile water, avoiding the introduction of air into the bladder. [In the United States, a popular medium for filling the bladder is a solution of 1:5000 of oxycyanid of mercury. This is sterile, antiseptic, and nonirritating.—EDITOR.] The quantity of fluid in the bladder should average between 150 and 200 c.c. Too much fluid might cause distention of the vesical walls and in consequence would increase the distance to the object to be examined; if on the contrary, insufficient fluid is injected, the walls of the bladder would be brought too near the beak of the instrument and this would prevent the easy manipulation of the beak, and thus obscure the view.

INTRODUCTION OF THE CYSTOSCOPE.—The slightest traumatism produced in the introduction of the cystoscope is sufficient at times to provoke a hemorrhage. If the bleeding obscures the prism, which is quite certain, it will surely mar the clearness of vision, whether the blood clouds the vesical fluid or merely because of a little blood clot adherent to the prism; in either event, the visual field is obscured. The cystoscope should be introduced into the urethra and bladder delicately, slowly, and gently. The accompanying illustrations will readily show the necessary maneuvers in the introduction of the instrument. Several distinct steps may be recognized:

First Step.—The operator places himself at the left of the patient, holds the cystoscope in his right hand, takes hold of the penis with his left hand and raises it so as to obliterate the penoscrotal angle. The beak of the instrument previously lubricated with sterile glycerin enters the meatus and gently follows the entire penile portion of the urethra, taking as its guide the inguinal fold, to which the penis and cystoscope are made parallel (Fig. 127). The gradual introduction of the cystoscope is made evident by the indicator button on the ocular of the instrument. In this first step the button indicator should likewise be directed towards the inguinal fold.

Second Step.—As with the introduction of a sound, the second step consists in bringing the cystoscope and the penis back to the median line, in a plane perpendicular to the pelvis (Fig. 129). The penis is still held in the left hand, and the cystoscope descends into the urethra by its own weight so that the beak engages the membranous portion of the canal.

Third Step.—The fully extended penis is now gradually lowered until the cystoscope is depressed slightly below the horizontal (Fig. 130). At this moment the operator takes hold of the penis and the cystoscope with the right hand, while the left hand makes flat pressure on the pubic region. This lowers the suprapubic ligament and

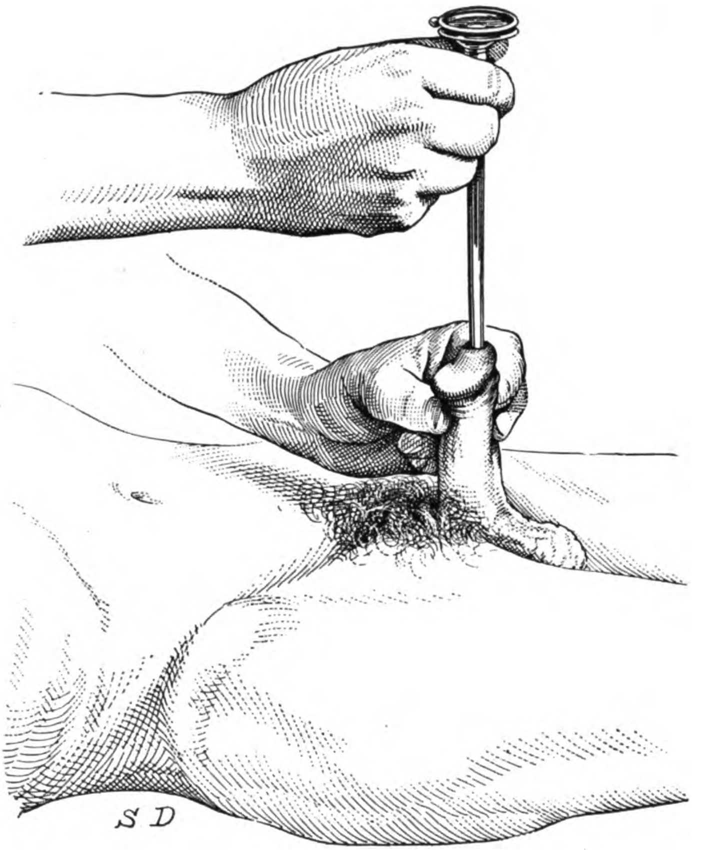

Fig. 129.—Third step in the introduction of the indirect cystoscope. The left hand draws the penis upward, while the right hand holds the instrument vertically and perpendicular to the axis of the pelvis.

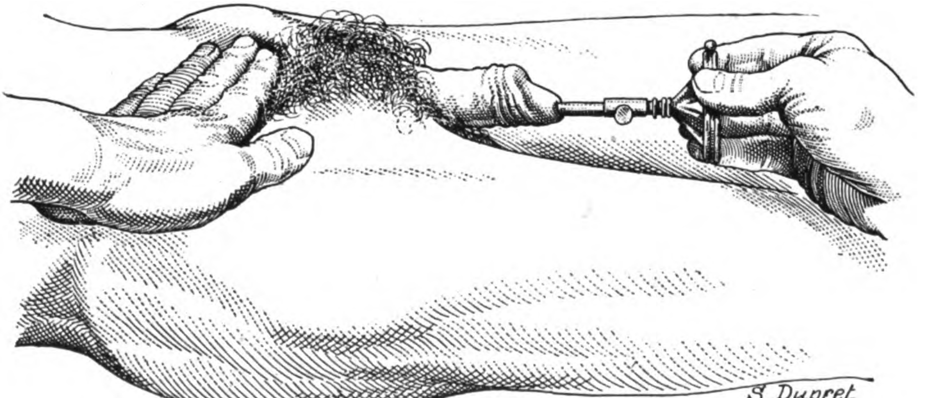

Fig. 130.—Fourth step in the introduction of the indirect cystoscope. The instrument and the penis are depressed between the thighs of the patient; the right hand gently inserts the instrument; the left hand makes pressure in front of the pubic region, so as to lower the subpubic ligament.

PLATE XI

FIG. 1.—*Silk thread seen in the bladder.* This silk thread was used for a vesicovaginal fistula following childbirth. It is curious to observe that the knot is found on the vesical side and not on the vaginal aspect where it was originally tied.

FIG. 2.—*Syphilis of the bladder,* showing bullous edema of the vesical mucosa. This condition seen in a patient of Jeanselme, came on coincidently with a secondary syphilis. While the patient still presented the roseola, she consulted me because of cloudy urine, and I found the lesions presented in this illustration. Examination made fifteen days later, during which time specific treatment had been given, showed that the bladder was restored to the normal condition.

Fig. 1.

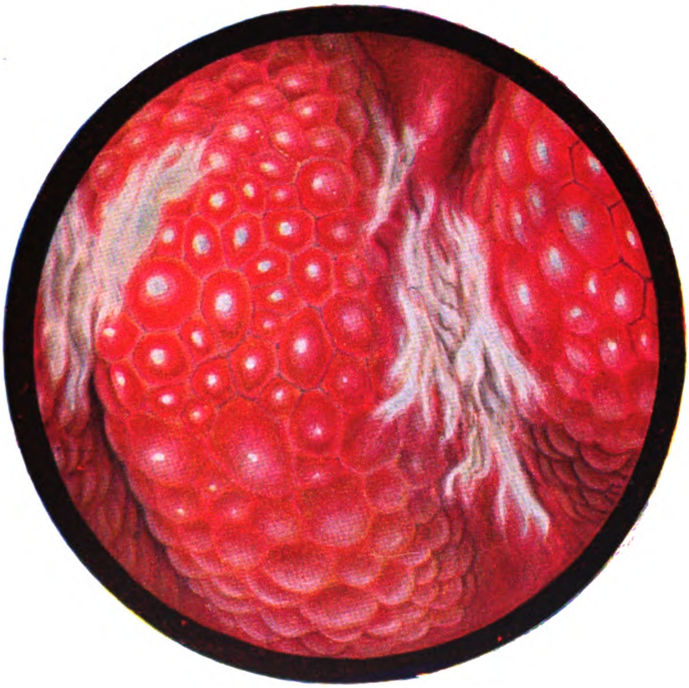

Fig. 2.

PLATE XI

permits the cystoscope to slip easily into the prostatic region as far as the bladder. That the instrument is in the bladder is shown when its beak can be rotated freely without any resistance being felt. The greatest difficulties are encountered between the second and third steps, particularly in cases of tuberculosis and hypertrophy of the prostate.

Once the cystoscope has been introduced into the bladder, the rotating contact which carries the current is attached to the instrument, and the lamp is lighted. The latter should always be kept away from the vesical wall and should never touch it directly. The complete examination of the bladder is then made.

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DIFFICULTIES OF PRISMATIC CYSTOSCOPY

Some of the difficulties that render cystoscopy unsatisfactory are due to the patient and others to the instrument.

Difficulties Due to the Patient

1. **Nervousness of the Patient.**—Often the patient is in such a state of fear, that he trembles all over, thus making the cystoscopic examination extremely difficult or impossible. It is well to gain his confidence by explaining what is to be done for him and by showing how useful the examination is going to be. It seems of small consequence, but it is very important not to light the lamp in the sight of the patient; for he is apt to believe that the lamp is going to burn him or burst inside of his bladder, thus adding considerably to his fears.

2. **Inflammation of the Urethral Mucosa.**—The urethra may be inflamed and present a more or less acute discharge. When the inflammatory lesions are recent, cystoscopy must be postponed so as not to increase the existing inflammation.

3. **Atresia of the Urethral Meatus.**—In this condition there are two courses to pursue: If the meatus is so narrow that it admits no instrument greater in caliber than No. 15 Charrière, meatotomy must be performed; or, as is more frequently the case, the meatus may be somewhat larger and will admit a No. 18 sound, but the introduction of the cystoscope causes considerable pain. In the latter circumstance, insert a little tampon of cotton saturated with a few drops of 10 per cent stovaine solution into the meatus and the fossa navicularis; dilate with

a metal dilator, similar to the one devised by Howard Kelly, and by gentle stretching, the cystoscope may be gently introduced.

4. **Spasm of the Bulbomembranous Urethra.**—In nervous patients, we frequently meet with a reflex spasm of the membranous sphincter which may be violent enough to completely prevent the introduction of the cystoscope. This may be overcome by lowering the head of the patient to the horizontal plane, bending the thighs on the pelvis, and having the patient breathe deeply and slowly. Finally, if these measures do not succeed, relaxation may be accomplished by injecting 10 c.c. of a 1 per cent stovaine solution into the anterior urethra.

[The editor usually overcomes this spasm by introducing a few alypin tablets into the deep urethra by means of Bransford Lewis' tablet depositor; this not only breaks up the spasm, but at the same time produces an excellent anesthesia of the deep urethra, and thereby facilitates the examination considerably.—EDITOR.]

5. **Urethral Stricture.**—Occasionally a stricture of the urethra prevents the introduction of the cystoscope. In these cases, the urethra must be dilated until its caliber is sufficient to admit the passage of the instrument comfortably.

In tuberculosis of the kidneys or of the prostate associated with cystitis, the posterior urethra and the membranous portion are often the seat of an inflammatory tuberculous process which causes alterations of the mucosa, thus preventing the comfortable introduction of the cystoscope. When the instrument reaches these parts bleeding ensues, which not only increases the pain but likewise obscures the prism and makes vision extremely difficult or altogether impossible. In such instances, slow and methodic dilatation should be instituted and the greatest gentleness should be exerted when the cystoscope is subsequently introduced.

6. **Prostatic Hypertrophy.**—In this condition, the canal is deformed and the cystoscope is forced to open a way for itself across the displaced prostatic lobes which are hypertrophied and usually congested. Here again, it is absolutely necessary to proceed with the utmost gentleness possible, so as to avoid trauma and hemorrhage.

7. **Diminished Bladder Capacity.**—Occasionally the bladder has not the proper capacity for its unfolded walls to be sufficiently distant from the prism of the cystoscope. For good cystoscopy, it has been determined there should be 200 c.c. of fluid in the bladder. Even with but 80 c.c. cystoscopy can be performed, but when the capacity falls below 60 c.c., the difficulties assume such grave proportions that any attempt at cystoscopy must be abandoned. In these cases, the underlying cystitis must be treated first, by irrigations or injections, and the

cystoscopic examination postponed to a subsequent time when the bladder mucosa has become sufficiently calmed.

8. **Contraction of the Bladder.**—Frequently, the patient suddenly begins to contract the bladder involuntarily during cystoscopy; particularly is this true in nervous women. The examination is thus rendered impossible. The instrument should be taken out quickly and the examination deferred to a later sitting.

9. **Opacity of the Vesical Medium.**—The vesical fluid may be made turbid by the presence of pus or blood. This occurs in hematuria or profuse renal pyuria, in which two or three ureteral emissions suffice to completely obscure the fluid in the bladder. In these circumstances the experienced cystoscopist employs his entire skill so as to be able to look quickly and to make his diagnosis as to the cause of the trouble during an unexpectedly good momentary view. In other circumstances, the operator will be obliged to use the irrigating cystoscope.

Difficulties Due to the Instrument

1. **Failure of Illumination in the Lamp.**—This is an extremely disagreeable occurrence. One should always have several reserve lamps at hand in order to make a change when necessary; it is better still to have other cystoscopes on hand, sterilized and ready for service, as a precaution against sepsis in changing the lamps.

When illumination fails, the fault is not always in the lamp necessarily; the other points of contact must be examined carefully, especially at the handle and at the rotating contact and interrupter. It is well to remember that only a very slight failure of contact is sufficient to interfere with the required illumination.

The electric contact, as is well known, is made by a metallic "spiral," the elasticity of which assures the continuity of current between the body of the cystoscope and the filaments of the lamp. When the lamp does not give a proper light, it is often sufficient to stretch or lengthen this little spiral with a pair of forceps and this will restore the passage of the current in the lamp.

2. **Obscured Vision.**—Cloudiness of the picture during cystoscopy may be due to different causes. The principal and most frequent is the result of faulty introduction of the cystoscope. When the operator is not skilled, he is apt to introduce the cystoscope not far enough into the bladder. In these circumstances, he finds himself plunged in darkness and sees absolutely nothing. To obtain a clear view the cystoscope should be pushed a little further into the bladder cavity so as to get free of the prostate and bladder neck.

The reverse may also occur. When the cystoscope has been inserted too far into the bladder, it is surrounded with vesical mucosa as in a hood (Fig. 131), with the result that nothing can be seen. By withdrawing the instrument a little, thus freeing the beak, the view becomes clear again.

3. **Spots in the Visual Field.**—This is unfortunately a rather frequent occurrence, met with especially when the instruments have been used for some time. When the spots are found on the ocular or on the prism, it is easy enough to remedy this condition, but at times the damage is more serious and the instrument must be repaired at the factory. These spots on the optical apparatus were quite frequent when the instruments were sterilized in trioxymethylene (paraform) vapor. When prismatic cystoscopes are permitted to remain in con-

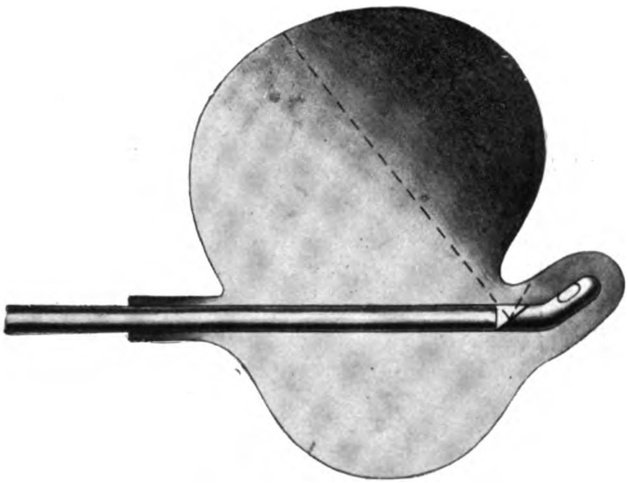

Fig. 131.—Faulty introduction of the cystoscope, which is covered by the mucosa as with a hood.

tact with this vapor for some time, the field of vision usually becomes clouded; for this reason, I recommended long ago, a special apparatus for sterilization of prismatic cystoscopes (Fig. 124).

4. **Opacity of the Vesical Medium.**—The difficulties which are the result of marked hematuria or pyuria, and which make the vesical medium opaque, will usually be avoided by the employment of the irrigating cystoscope.

5. **Opacity of the Window of the Prism.**—Unfortunately even when the cystoscope has been introduced into the bladder correctly, the operator often finds it impossible to get a clear image, because in passing through the urethra the prism has been soiled with blood. This is encountered quite frequently in connection with hypertrophy of

the prostate, which bleeds easily and thus soils the prism. The irrigating prism is extremely useful in these cases.

Finally, other complications may rise from the optical apparatus, —the lenses may get out of order or the diaphragm may encroach upon the visual field. All these conditions are due to the wear and tear of the instruments and require attention at the hands of the manufacturer.

CYSTOSCOPY IN THE FEMALE

In the female, cystoscopy is much simpler than in the male, because the female urethra is shorter. The cystoscope is generally introduced without any difficulty; but cases occur, however, in which the meatus is narrowed by stricture, and this must be dilated. Local anesthesia may be produced by inserting in the urethra a pledget of cotton saturated with several drops of a 10 per cent solution of stovaine. [A 2 per cent solution of alypin or novocaine is highly satisfactory for this purpose, without the risk attending the use of stovaine.—EDITOR.]

Dilatation of the urethral meatus should be carried out with extreme gentleness, for a considerable amount of dilatation is not essential. Furthermore, since this is usually followed by slight bleeding, gentleness is required so that the prism of the cystoscope shall not be blood stained in passing through the urethra.

CYSTOSCOPY IN CHILDREN

Because of the small caliber of the urethra in the child, it is necessary to use specially constructed cystoscopes particularly in boys. Instruments have been made exceedingly small, with a caliber corresponding to No. 15 Charrière; and with these instruments it is possible to make a fairly satisfactory examination in children.

In girls, the urethra being short and much more easily dilated than in boys, the use of cystoscopes of reduced caliber will not be nearly so frequently required; in boys, however, it is sometimes impossible to get along without these special models. It goes without saying, that the visual field in these instruments is necessarily limited. Besides, they are fragile and much more delicate than the ordinary cystoscopes.

CARE OF THE CYSTOSCOPE

The indirect vision cystoscope requires a great deal of care and should be kept perfectly clean. It should be protected against jarring and against dust and dampness. Nothing is more unpleasant than finding one's instrument unfit for use when it is needed.

As regards the catheterizing cystoscope, the ureteral attachment is washed freely with water immediately after use; it is well to cleanse the entire instrument thoroughly with soap suds. The ureteral portion and the rubber cap should be boiled in water and the rest of the instrument cleaned inside and out with oxycyanide of mercury solution or alcohol; but the latter should not be permitted to remain on the prism for it might loosen it. The cystoscope and all its accessories are then thoroughly dried, the ocular well corked and put away in a dry place.

ADVANTAGES OF INDIRECT VISION (PRISMATIC) CYSTOSCOPY

The prismatic cystoscope has distinct advantages. This marvelous instrument offers a clean-cut thorough examination of the bladder combined with a large visual field (Fig. 132). A large area is brought

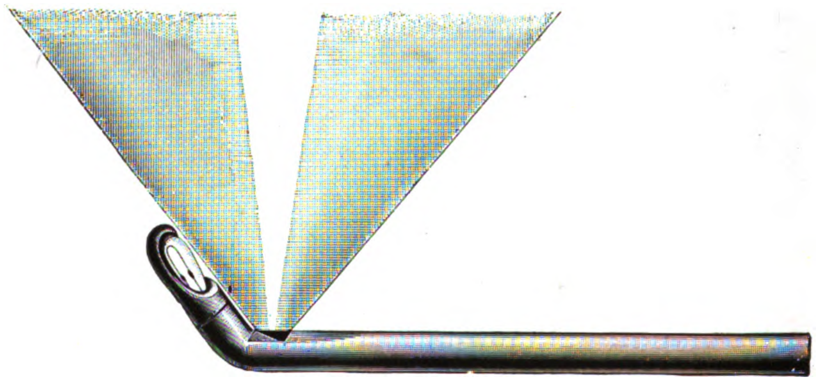

Fig. 132.—Large visual field of Nitze's cystoscope.

into view, not a small spot, thus making a general examination easily possible. If a tumor is present, its general relations, its surface and sometimes its implantation can be plainly seen.

A second great advantage is that the caliber of the instrument is diminished and that it is introduced into the bladder with comparative ease. The two great advantages of this method are, therefore, the reduced caliber of the instrument and the large area of the visual field, which brings a considerable portion of the vesical mucosa within range of the eye.

DISADVANTAGES OF INDIRECT VISION CYSTOSCOPY

1. **Considerable Experience Is Required.**—It is impossible for a novice to make a successful examination the first time he uses this

instrument; in order to establish a diagnosis in accord with the data presented by the instrument, it is absolutely necessary to be well accustomed to cystoscopic manipulation.

The novice must train his eye and his hand; his eye, in order to learn how to look at the image and to give it a correct interpretation; his hand, so as to be able to place the instrument in a proper position; that is, neither too far from nor too near the object.

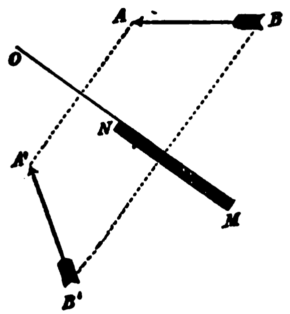

Fig. 133.—Schematic representation of the reflection of an image in a plane mirror (Nitze).

2. **The Image Is Reversed and Deformed.**—Primarily the prism reverses the picture, but in the vertical plane only. In the transverse plane, on the other hand, the image maintains its real position. In other words, the eye sees on the right side what is really on the right side, and on the left what is actually on the corresponding side. On the other hand, what is actually in front appears posteriorly and the posterior portions of the image appear anteriorly.

In order to understand the deformities caused by the cystoscopic prism, the laws of reflection in plane mirrors should be borne in mind.

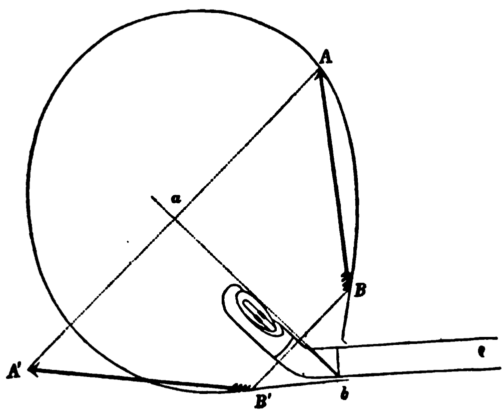

Fig. 134.—Schematic representation of Nitze's system.

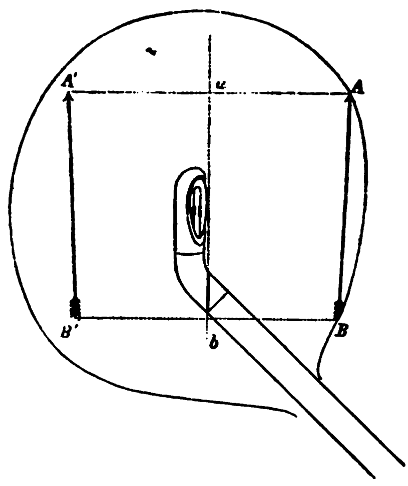

Fig. 135.—Schematic representation of Nitze's system.

It is well known that the image of an object placed in front of a plane mirror is seen at a point equidistant behind the mirror; the image is symmetrical with the object. The arrow *AB* (Fig. 133)[1] which is reflected by the mirror *MN* is in reality seen in the points *A′B′*.

In Figs. 134, 135, 136, and 137,[1] it may be seen how the images of

the bladder are really perceived, according to the different ways in which the cystoscope is held. The lines *ab* represent the prolongation of the cystoscopic mirror; the arrow *AB* represents the object, and the arrow *A'B'* represents the real position of the image. It is thus understood how the images seen through the cystoscope may be de-

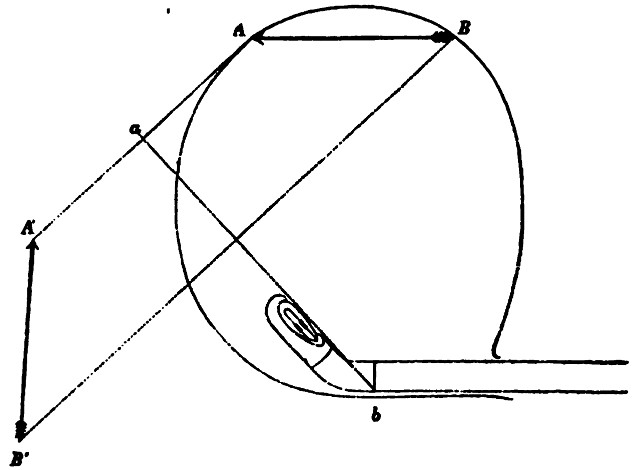

Fig. 136.—Schematic representation of Nitze's system.

formed and different from the reality. Even though the operator succeeds in understanding these inversions and in correctly interpret-

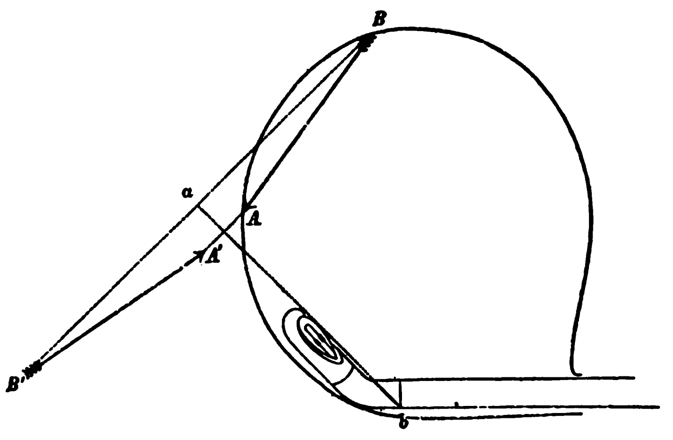

Fig. 137.—Schematic representation of Nitze's system.

ing them, the eye must, nevertheless, become accustomed to them only after considerable practice.

The determination of the real size of the object is likewise affected by the deformity caused by the prism. According to the position of

the prism, more or less close to the object in the bladder, an image correspondingly large will be obtained. Considerable experience is, therefore, required to determine what size to attribute to a tumor of the bladder, for example. Frank's cystoscope has obviated the first objection by allowing the object to be seen by corrected vision; nevertheless, it has not remedied the second objection, for the portions nearest the prism are considerably enlarged while those farthest off are much smaller. [All American cystoscopes are now constructed so as to eliminate the reversed image.—EDITOR.]

3. **A Tolerant Bladder Is Required.**—To obtain a good view, it is essential that the vesical walls be sufficiently separated from one another; otherwise a dim and hazy view is obtained. Very often the bladder contracts very painfully in spite of the use of a local anesthetic such as stovaine, and this renders the examination impossible notwithstanding all our efforts. The examination must then be abandoned.

[General anesthesia may be resorted to in these cases with satisfactory results.—EDITOR.]

4. **A Transparent Medium Is Required.**—The fluid medium in the bladder should remain transparent throughout the examination. This essential condition is extremely difficult to attain, at times, when we are dealing with a severe cystitis, profuse renal pyuria, or hematuria of prostatic, vesical, or renal origin. It is but proper to add that these disadvantages are overcome by the use of copious irrigation; but there are cases in which the obstacles are absolutely insurmountable and the examination must be abandoned.

Attempts have been made to avoid this difficulty by filling the bladder with air under pressure, instead of water; this constitutes a medium which remains transparent constantly, but the view of the vesical walls is defective when seen under these conditions. Nitze has advised against this method, insisting particularly on the fact that the vesical walls appear as though they were covered with brilliant varnish, thus making the examination difficult.

It is impossible to obtain a clear view if the prism is too near the object to be examined; the instrument should be held at the proper distance. When this can not be done because of certain deformities of the bladder, vision through the cystoscope becomes extremely difficult. This is frequently met with in pregnancy.

REFERENCE

[1]Nitze: Lehrbuch der Kystoscopie, Wiesbaden, Bergman, 1907, pp. 126, 127.

THE NORMAL BLADDER AS SEEN THROUGH THE INDIRECT VISION (PRISMATIC) CYSTOSCOPE

When the cystoscope has been introduced into the bladder and the prism is turned toward the roof, a bubble of air is seen, which indicates the summit of the bladder. Anteriorly, is a rather poorly illuminated depression. This represents the projection of the bladder above the pubis, and in the female constitutes the suprapubic recess. Scattered throughout the vesical wall are blood vessels which radiate like stars.

When the prism is turned downward, the line of the interureteral ligament or muscle is plainly seen; this stands out clearly and prominently as a thin, well-illuminated band.

Behind this line is a depression, which corresponds to the bladder fundus. Anteriorly, the trigone is seen, always more vascular.

Turning the prism laterally, the side walls of the bladder come into view. In the female, because of the uterus, they appear depressed and constitute the so-called horns of the bladder.

The neck of the bladder deserves special attention. When the prism is turned superiorly the neck appears in the form of a crescent, with the convexity above, dark red in color; this tint being somewhat less illuminated, can always be differentiated from the paler color of the rest of the bladder. Turning the cystoscope laterally, the bladder neck resembles a crescent shaped like the last quarter moon, the points of which are always less clearly defined. Finally, when the prism is turned downward, we find the lower part of the neck not so sharply outlined, with the result that the margin of the neck can not be so well differentiated. At this point the neck does not project, but seems to be continuous with the posterior urethra.

Locating the orifices of the ureters is generally quite simple and easy. For this purpose the circumference of the ocular may be likened to the dial of a clock. Taking the little indicator button attached to the ocular as a guide, the beak of the cystoscope is placed to correspond to six o'clock on the dial; that is, turned entirely downward and on the median line. Having found the bladder neck, the instrument is pushed backward about 2½ centimeters; the instrument is then turned on its axis so that the indicator button corresponds to eight o'clock on the dial for the right side, and to four o'clock for the left side. Now we have the corresponding ureteral orifice.

To examine the entire cavity of the bladder systematically, a certain series of movements should be executed by the instrument: 1. Anteroposterior movements which bring the beak from the bladder neck to

the posterior bladder wall. 2. Rotary movements around the axis, the latter remaining stationary. 3. Seesaw movements, by lowering and elevating the ocular. The latter movements are made from above downward or laterally from side to side. These movements are perhaps the most important in obtaining detailed cystoscopic images. By noting the different images obtained as a result of these movements of the cystoscope, a clear impression of the real size and location of the object is attained.

Nitze has described briefly how the different parts of the bladder may be examined systematically and methodically, as follows:

1. The beak of the instrument having been introduced into the bladder, it is pushed backward till it comes into contact with the posterior bladder wall.

2. The beak is now turned from the median line to the right at an angle of 45 degrees; the instrument is now brought forward toward the neck of the bladder.

3. Having reached the neck, the beak is turned 45 degrees to the left; an effort being made to hug the left vesical wall as closely as possible, the instrument is again pushed backward to the posterior wall.

4. Finally, the beak is again turned downward, and the ocular depressed; this movement permits the examination of the most important portion of the bladder, namely, the fundus and the trigone. By making these movements methodically, the entire vesical mucosa can be examined, so that only the minutest portions can escape observation.

THE PATHOLOGIC BLADDER AS VIEWED THROUGH THE INDIRECT VISION (PRISMATIC) CYSTOSCOPE

Cystoscopy in Cystitis

Acute Cystitis.—Cystoscopy should not be done in acute cystitis except in very exceptional circumstances, for this examination is apt to be more injurious than useful to the patient. In this acute condition, the vesical mucosa may be desquamated and ulcerated; the slightest contact of an instrument with the inflamed mucosa is sufficient to provoke a more or less severe hemorrhage. Severe pain accompanied by a marked febrile reaction may also result. In these circumstances, the examination must be postponed until the pain and fever have subsided through appropriate treatment.

The inflamed mucosa is generally of a diffuse red color, and turgid

like velvet; this condition being due to the loss of epithelium. The entire structure and consistency of the mucosa are altered. In this connection, Zuckerkandl, of Vienna, has shown that the bulb of an olivary bougie can be buried in the substance of the turgid vesical lining without injuring the mucosa. Invariably the inflammation takes place at the fundus of the bladder and is always more marked at this point. The pathologic alteration is in direct proportion to the intensity of the inflammatory process. The coloration varies from a very faint redness to a very dark blue, like lees of wine, with all the intermediary shades. Even a beginner finds it easy to diagnose the presence of an inflammatory condition of the vesical mucosa, the inflammatory color of which contrasts strikingly with the smooth and brilliant yellow surface of the healthy mucosa.

In acute cystitis, the blood vessels can not any longer be recognized; the inflamed patches may be circumscribed or extensive. They manifest themselves either under the form of small plaques or of little round patches like small islands. In the early stages of cystitis the mucosa often has the appearance of a geographical map. The bladder is invariably dark red and the normal mucosa can not be distinguished. At the same time, there is a swelling of the mucosa which frequently becomes edematous, the mucosa then seems to form little hills and valleys, and sometimes the inflammation is so great that it takes on a varicose or polypoid appearance. The epithelium of the inflamed membrane soon exfoliates and this is followed by ulceration and destruction of the mucosa. Simultaneously there is also produced a fibrinous exudate with considerable pus which floats about in the bladder fluid. The lighter purulent flakes float on top of the vesical medium; the heavier masses fall to the bottom of the bladder where they accumulate. This accumulation of debris may very often completely prevent the cystoscopic examination, and it becomes necessary to change the fluid repeatedly or to employ the irrigating cystoscope.

2. **Chronic Cystitis.**—As compared with acute cystitis, the principal feature characteristic of chronic cystitis is that the inflammatory lesions, instead of being spread over the entire bladder and covering the mucosa uniformly, are, to the contrary, considerably circumscribed.

As previously mentioned, the most important lesions are found usually at the fundus. A considerable difference can be noticed between a fundus which shows important lesions and the apex, which has the appearance of a perfectly healthy mucous membrane. The vesical mucosa may be red, the coloration being in direct proportion to the capillary engorgement. The arterial vessels considerably dilated and increased both in size and number, are tortuous and fade gradually

into the redder patches. Little red stains are observed upon the vessels, which, by uniting, increase the extent of the inflammatory plaques.

Chronic cystitis is characterized usually by the presence in the fundus of little mushroom-shaped growths of a reddish color, among which exuding masses are found. At times these excrescences take on rather considerable growth, even to the extent of resembling a real papilloma.

Often, the mucosa is pale and anemic. This is due, according to Nitze, to the disappearance of the superficial vessels of the mucosa, probably as the result of the thickening of the epithelium which covers the blood vessels. When the capillary vessels reappear under the influence of proper treatment, a cure may be expected.

The mucosa may also take on the appearance of a mosaic (Plate XV, Fig. 2); the base is of a rose yellow color and the design of the mosaic is formed by the engorged vessels. In other instances, as Nitze has well demonstrated, the vesical mucosa resembles leather, with prominences which resemble heaps of wheat grains or lentils. At other times, the mucous tumefaction may assume marked proportions; projections in the form of sausages (Nitze) may be seen prominently throughout the bladder upon the hyperemic mucosa. These projections are not to be confounded with the bladder trabeculations; sometimes they assume the form of a cockspur and are usually separated from one another by deep depressions.

In more severe cases the bladder is covered by a great number of villosities which give it the appearance of a lawn; this type is known as "villous cystitis." The cystoscopic picture is indeed striking in these cases, for these graceful villosities take on the same movements as are observed in a wheat field moved to and fro by the wind (Nitze).

Under the designation of "parenchymatous cystitis," Nitze describes a pathologic condition of the vesical mucosa in which the entire wall of the bladder is completely changed by the intense inflammations, or those of long duration; in this condition because of the presence of scar tissue, the vesical wall can no longer distend itself without producing pain. In these cases some portions of the mucosa are found in a highly inflamed condition, glossy, bright red, well circumscribed and without any special shape, surrounded by mucous-membrane which is normal, or but slightly inflamed. The affected part seems very smooth and glossy, and upon its surface are seen little raised areas like grains of sand which are very red in color. When such a bladder is filled with water and the patient suffers very acute pain, the cystoscope shows a little crack or tear in the bright red glossy portions in which bleeding takes place. This parenchymatous type usually culminates in a shriv-

PLATE XII

Fig. 1.—*Normal aspect of the neck of the bladder,* when the tube of the direct vision cystoscope has been deeply introduced: Below, on the first row, is seen the red fundus of the bladder, behind the line of which is distinguished a very small quantity of urine not yet evacuated. The rest of the figure represents the posterior and superior walls of the bladder less brightly colored. The vesical reservoir is then greatly distended because of the reclining position.

Fig. 2.—*Aspect of the bladder,* not well dilated by the reclining position.

Fig. 3.—*Pathologic aspect of the right ureter chronically inflamed,* under the influence of too highly concentrated urine. The lips of the ureteral orifices are edematous and swollen and the same marked chronic inflammation is seen in the immediate region which the urine must follow in leaving the ureteral orifice.

Fig. 4.—*Aspect of plaques of simple chronic nontuberculous cystitis* seen with the direct vision cystoscope. These plaques are frequently observed in chronic cystitis and are much more easily distinguished with the direct vision cystoscope when the tube is held in profile, than when seen in full view. This was a case of cystitis which had developed in a woman with simple pyonephrosis, in which all the bacterial examinations and guinea pig inoculations were negative.

Fig. 5.—*View of a papillomatous tumor of the bladder* seen with the direct vision cystoscope.

Fig. 6.—*Normal vesical wall in contraction.* This view can not be observed well except with the direct vision cystoscope, for in indirect prismatic cystoscopy, the walls are distended by the liquid and can not contract freely. In the lower part of the figure, the interureteral mucosa is seen; in the upper part during a vesical contraction, the bladder comes close to the extremity of the tube, and assumes the appearance of intestinal convolutions.

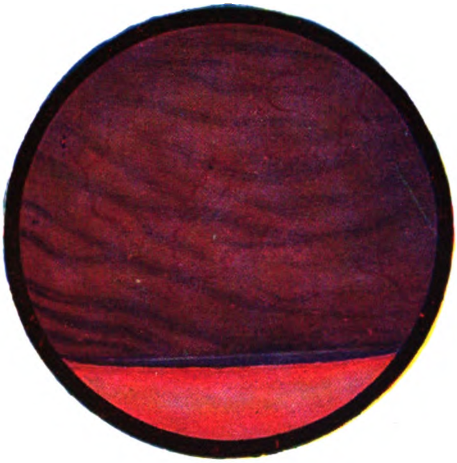

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

PLATE XII

eled up bladder and is frequently the result of a tuberculous process.

Follicular or granular cystitis is quite common. It appears in the form of a subepithelial infiltration made up of lymphatic follicles which are filled with lymphoid cells. Occasionally these follicles are separated from one another by healthy tissue; or they may be very close together. They sometimes consist of numerous little limpid vesicles as large as lentils, sometimes smaller (Plate XII, Fig. 4, and Plate XIV, Fig. 1). They may also be disseminated over the entire mucosa, resembling drops of water, clear as crystal. This is the condition which Orth has designated under the title of "Herpes Vesicalis" (Plate XIV, Fig. 2). These vesicles may resemble caviar, or when larger, they may simulate varioloid pustules (Nitze). These follicles, the contents of which may be clear, cloudy, or purulent, seem to have no very distinct significance so far as the diagnosis and prognosis are concerned.

It was formerly believed that this form of granular cystitis is encountered in cases which are tuberculous in nature. Such is not the case, however; in many instances, this form of cystitis is met with in cases in which there is not the slightest suspicion of tuberculous infection.

In the case of a young woman with an enormous nontuberculous pyonephrosis with chronic cystitis, examination of the centrifuged urine and guinea pig inoculations proved conclusively that tuberculosis was out of the question (Plate XII, Fig. 4). The patient was nephrectomized, and she recovered completely. The removed kidney presented no tuberculous lesions. Seen again eight years later, her bladder was in perfect condition and did not show the slightest trace of granular cystitis. Tuberculosis was, therefore, completely excluded.

Gonorrheal cystitis is characterized by the presence of circumscribed inflammatory plaques in which the bright red mucosa is covered with vessels gorged with blood. These plaques are usually found around the neck of the bladder chiefly on the lower wall. The epithelium is most often exfoliated and floats in the vesical fluid.

Tuberculous cystitis often gives such a characteristic cystoscopic picture that the exact diagnosis can be made frequently at the first examination by the expert eye. It is characterized in the early stages by the presence of small elevations in the form of nodules the size of a pinhead or of a lentil, and of a red or brown color. Each of these nodules is at first surrounded with a circle of very fine blood vessels; they soon become ulcerated, are round or irregular in form, and almost entirely surrounded by a very red border. These ulcerations frequently have the appearance of a finger nail scratch or dent; they are

arch-shaped and deep, affecting the vesical mucosa throughout its entire thickness. The base of the ulceration is wrinkled and dirty and yellowish in color. The edge of the ulceration is elevated like a rampart, as if cut with a saw (Nitze). Immediately surrounding the ulceration the vesical mucosa is very red and thick; as many as five to twelve nodules and ulcerations may coalesce, forming herpetic groups separated from one another by a strip of mucosa which is sometimes entirely normal, at other times faintly reddish in color.

The nodules occasionally present themselves in the form of a collar or ring; at other times they arrange themselves around a blood vessel producing the appearance of a branch of bilberry (Nitze). When the nodules or ulcerations are fairly limited around the ureteral orifices, the opposite orifice being completely normal, the diagnosis of renal tuberculosis can be positively made by a simple cystoscopy (Plate XVI, Fig. 1).

Under the name "vesical leucoplakia," Brick has described a cystoscopic appearance consisting of bright white plaques which are elevated above an extremely red vesical mucosa. These plaques are very adherent to the underlying tissue; if they are rubbed with cotton, the deep-seated mucosa bleeds. When examined microscopically it can be seen that they are histologically thickened epithelium. A typical vesical leucoplakia is seen in Plate XV, Fig. 1.

"Bullous edema," described by Kollischer, is found particularly in women. It appears in the form of clear vesicles, the size of a grain of wheat or that of a small pea; they may also be found much larger. This condition is met with in phlegmasia of the uterus or of its adnexa, especially in cancer of the uterus (Plate XXI, Fig. 1, and Plate XXIV, Fig. 3); it is also found in certain cases of pyosalpinx.

The catarrhal exudate which accompanies cystitis is more or less abundant according to the severity of the inflammation. Its composition is almost constantly the same; masses of exfoliated vesical epithelium, leucocytes and red blood cells may always be found in it. When the urine undergoes ammoniacal fermentation, the exudate becomes more dense and contains both amorphous and crystalline salts. When purulent masses predominate in the catarrhal exudate, they may adhere to the surface of the mucosa and thus completely change its appearance. When, however, they become mixed with the vesical fluid, the latter becomes turgid and opaque. In mild cases the exudate consists of little masses of pus or mucus which cover a considerable portion of the bladder mucosa. These mucous masses are white or grayish in color, and often resemble snowflakes. When gathered together at the fundus they may be mistaken for a vesical calculus. In more severe

cases the exudate is seen in the form of a membrane which becomes detached from the vesical wall from time to time and crosses the field of vision abruptly like a silver fish (Nitze). Occasionally false membranes are seen adherent to the vesical mucosa by one of their margins. Their unattached portions float freely in the vesical fluid like a curtain blown by the wind, or like aquatic plants (Nitze).

Cystoscopy in Bladder Tumors

When a bladder tumor is comparatively small and does not bleed, the image produced in an indirect vision cystoscope is often very fascinating. The splendid outlines, the pinkish, bright red color, the fimbriæ floating freely in the fluid like seaweeds or like an octopus, constitute a splendid picture. At times, the tumor is small and may be seen in its entirety in the visual field; at other times it is much larger, so that the cystoscope must be moved about in order to reveal the entire tumor. It is sometimes difficult to determine whether the tumor is pediculated or not, for the pedicle is frequently hidden by the mass of the tumor. There are cases, however, in which a pedicle may be assumed to be present by virtue of the fact that the tumor floats in the vesical fluid.

On the other hand, when the tumor adheres closely to the vesical wall, and especially when arterial pulsations are visible, it is evident that the tumor is not pediculated. In certain instances when the tumor is very large, the most prominent portion may escape observation entirely because of the complete darkness of the field. For example, a tumor is found on the right side of the bladder. The operator begins by introducing the cystoscope so that the lens and the lamp point upward; the entire pale vesical mucosa can be seen perfectly. As the cystoscope is turned toward the right, the image becomes obscured progressively until total darkness supervenes and nothing can be seen. However, as the rotation toward the right continues, the lower part of the bladder comes into view with its normal mucosa. The dark area evidently corresponds with the most prominent portion of the tumor, which, coming closely in contact with the prism and the lamp, makes distinct vision impossible. It is, therefore, necessary in these cases, to vary the position of the instrument in order to be able to appreciate the exact volume of the tumor.

The differential diagnosis between a benign and a malignant tumor of the bladder can often be made by the cystoscopic view of the mass. A benign tumor is characterized by the villi which we have already mentioned,—delicate, multiple and floating in the vesical fluid. These benign tumors are also characterized by the fact that they float about

in the bladder, being very light in weight. They often resemble certain marine animals, in appearance, such as the anemone. They may resemble a bunch of grass or moss; or they may have long and narrow villosities; at other times they have the form of a leaf, a cauliflower, a bunch of herbs, or an aquatic plant. When the tumor is near the ureteral orifice, the ureteral ejaculation sets them in motion in the bladder fluid. At times, they may present movements synchronous with the pulse; this is an evidence of intense vascularization. Their color is generally rather pale, and varies from clear pink to a dark rose, with often an intermediary discoloration of red ecchymotic spots.

Malignant tumors, on the other hand, are usually part and parcel of the vesical wall. They consist of large massive infiltrations in the form of hemispherical nodules or of irregular swellings projecting very slightly from the surrounding vesical wall. Their surface is smooth or verrucous. When villosities are present, they are small and curved. They appear hard and firm, like wood, often in the shape of a potato; they are motionless and do not float. Their upper part or summit is often covered with whitish masses like a snow-covered mountain. This appearance is usually due to necrosis of the superficial portions of the tumor. When these malignant neoplasms become ulcerated, they take on the appearance of a crater at the bottom of which are seen nodular granulations.

The coloring of malignant tumors is also different from that of benign growths. Most of the time the color is much darker,—usually dark red, black, or violet, occasionally resembling the lees of wine. Finally, malignant tumors are never pedunculated and their bases adhere closely to the vesical mucosa and are continuous with it.

[American urologists are prone to regard all bladder tumors either as actually or potentially malignant in character. A benign tumor of today may be the malignant tumor of tomorrow. Clinically the diagnosis is impossible; biopsy via the operating cystoscope, often helps to clear up doubtful points, but even this method is open to the objection that a tumor may not show malignancy in some portions, while other portions may offer absolute proof of its malignant character. Therapeutically the diagnosis may be made tentatively on the theory that benign tumors disappear under "fulguration" and do not recur, while malignant growths are not affected by this method of treatment. The matter is still unsettled.—EDITOR.]

Cystoscopy in Certain Anomalies of the Bladder

1. **Diverticulum.**—This anomaly is met with especially in the fundus and near the bladder neck. The mucosa which covers the interior

of these diverticulæ is generally smooth and without folds. At times they may be quite large and may resemble secondary bladders. Sometimes they are large enough to permit the introduction of the cystoscope.

2. **Varices.**—Varices have been observed by Viertel and Zuckerkandl, especially in pregnancy. I have been able to see them often in pregnancy, in the service of Bar. They may be seen in men, and in women independently of pregnancy, but quite exceptionally. They may cause hemorrhage (Guyon, LeFür, Baraduc) grave enough to necessitate suprapubic cystotomy. In prostatic hypertrophy, dilated vessels may be seen near the base of the prostate. Viertel has observed premenstrual hematuria. In these cases it is the parenchyma of the mucosa which bleeds and it is only very rarely that the blood may be seen issuing from a blood vessel.

Cystoscopy in Cancer of the Uterus

The observations on the importance of cystoscopy in uterine cancer[1] which I published some years ago, have been confirmed by Cruet[2] and by Violet and Murard.[3] Bladder cystoscopy is absolutely necessary in uterine cancer, for the cystoscope determines the indications for or against hysterectomy. Indeed, nothing but cystoscopy can tell us whether or not the bladder is involved in the cancerous process; moreover, if the ureteral orifices or the ureters themselves are seen to be compressed by the uterine cancer, it will indicate that the urinary function has been seriously compromised, thus constituting a distinct contraindication to surgical intervention.

When the neoplasm has passed beyond the limits of the uterine neck and the upper extremity of the vagina, it diffuses itself in the pericervical cellular tissue; the neoplastic granulations come in contact with the bladder and the ureters, compress them, adhere to them, and invade them. These vesical adhesions make operative intervention difficult and may induce the surgeon to perform more or less extensive resections of the vesical floor,—resections which often produce the most deplorable results. We may, therefore, agree with Cruet, that the condition of the bladder is the determining factor as to whether a cancer of the uterus shall be operated upon or not. Cystoscopy, therefore, reveals the extent of the neoplasm and decides for us as to the advisability or the facility of surgical intervention applied to the uterus. By showing that the bladder is normal, cystoscopy will determine the character of the operation notwithstanding unsatisfactory clinical data. On the other hand, cystoscopy will reveal some cases to be inoperable, when they seem clinically to be operable.

Direct vision cystoscopy is to be preferred to any other method of examination of the bladder in cancer of the uterus. We have constantly employed this method in the observations which we have made, and which are mentioned further on (see page 234).

REFERENCES

[1]Luys: Verhandl. d. deutsch. Gesellsch. f. Urol., II Kongress in Berlin, Leipzig, Georg Thieme, April 19-22, 1909; Oscar Coblentz, Berlin.

[2]Cruet: Ann. de gynéc., Jan. and Feb., 1913, pp. 1 and 70.

[3]Violet and Murard: Revue de gynéc., Feb. 1, 1913, xx, No. 2, p. 129.

Cystoscopy of the Cancerous Bladder

Cystoscopy of the bladder invaded by cancer comprises the following:

1. Examination of the vesical mucosa. 2. Examination of the ureteral orifices and ureteral ejaculations. 3. Catheterization of the ureters and the determination of the capacity of the renal pelvis.

1. **Examination of the Vesical Mucosa.**—

VASCULARIZATION OF THE MUCOSA.—When the bladder is at first invaded by the cancerous infiltration which has extended from the uterus, cystoscopy brings into view the changes which have occurred in the vessels of the mucosa. These occur principally at the vesical trigone, and consist in the beginning of an increase in caliber and quantity, being indicated by the presence of fine isolated hemorrhagic effusions. By their cohesion they give the vesical mucosa a congested appearance, made evident by an intense redness, which gives the vesical mucosa a dark ecchymotic or perhaps a violet tint. Here and there small ulcerations may be observed, buried amid a red and congested mucosa and showing minute hemorrhages (Plate XXI, Fig. 2). This explains the ease with which the mucosa bleeds when it comes in contact with a cotton carrier or with the cystoscope. The vesical surface looks raw and the epithelium is exfoliated. This is the first stage and may remain in this condition for a considerable period of time, the lesions are usually confined to the trigone.

EDEMA.—Later on, edema appears in a more accentuated degree, this being the most usual accompaniment of cancer of the bladder. Edema is at first indicated by the presence of folds and swellings, which showing themselves first at the trabeculations, become more and more numerous and voluminous and end in the formation of more or less coherent edematous masses. Most of these edematous folds are found behind the trigone, at the fundus of the bladder.

The cystoscopic picture varies according to the size and number

of these bodies. The edematous vesicles may be translucent and their size may vary from that of a pinhead to a grape. At times they are red and ecchymotic; at other times, they resemble gelatinous balls, of a light blue tint; again, they are joined together and form a whole, which Fromme has described as resembling a cushion. They may also be disseminated and separated by folds or by less edematous portions (Plate XXI, Fig. 1, and Plate XXIV, Fig. 3).

When the edema is extremely marked, it is termed "bullous edema," first described by Kollischer. This consists of a mass of clear vesicles, the dimensions of which vary between a pinhead and a large grape.

Invasion of the Bladder by Cancer.—Simultaneously with the edema, invasion of the vesical mucosa by the cancer may frequently be observed. This appears at first in the form of little oval or round plaques the size of a pinhead, resembling candle drippings. Later on, the granulations become more red and constitute little nuclei which appear prominently on the mucous surface. Or the cancer may manifest itself in the form of vegetations which form branching arborizations; these are well shown in Plate XXI, Fig. 1.

It is especially interesting to study the onset of cancer of the bladder with the direct vision cystoscope. With this instrument the bladder may be seen not only at full view but in profile, and under these conditions the slightest elevation of the mucous membrane can be readily observed. In a more advanced degree, nuclei are formed in the thick substance of the vesical mucosa; they are distinguished by their hardness and opacity, and especially by the extreme facility with which they bleed on the slightest contact.

Perforation of the Bladder.—When the lesion has developed for quite a long period, the result is almost certainly a perforation of the bladder communicating with the vagina. This perforation appears in the shape of an ulceration almost entirely concealed by edematous masses or covered over by false, white membranes. These vesicovaginal fistulæ of cancerous origin are always indicative of an unfavorable prognosis.

Swelling of the Bladder Fundus.—German authors have attached quite considerable importance to the bulging of the fundus of the bladder, but it does not seem to me that this curvature of the vesical wall has any particularly specific meaning in the diagnosis of secondary invasion of the bladder by cancer. The simple elevation of the bladder fundus indicates nothing but the development of a mass behind the bladder. This is observed in pregnancy, as well as in retroversion, fibroma, and cancer. With the direct vision cystoscope this

bulging is very seldom seen, because of the reclining position of the patient; in any event when it exists alone, it can not be considered as a contraindication to surgical intervention.

2. **Examination of the Ureteral Orifices and Ureteral Ejaculation.**—Cystoscopy enables one to investigate the condition of the ureteral orifices and of the ureters themselves with great precision. The appearance of the orifices may be modified more or less by the presence of edema of the vesical floor. These orifices may become entirely invisible, depending on the extent of the edematous masses. At other times the orifices are more or less narrowed, swollen, enlarged, and their edges edematous. Enlargement of the ureteral orifice often indicates the presence of a stricture higher up in the canal.

The study of the ureteral ejaculation is also of considerable importance. It is best seen with the direct vision cystoscope. Indeed, with this instrument the emission can be seen in profile in the form of a very small jet of water; the intensity of this emission denotes the condition of the ureteral musculature. The emission should be studied as to its rhythm and as to its strength, both of which are subject to wide modifications.

3. **Catheterization of the Ureters.**—Mere inspection of the ureteral orifices is not sufficient; in addition, it is well to catheterize both ureters with fine catheters whenever it is possible to do so; for in this way alone can we be assured of the free flow of urine in the ureters. Not infrequently in spite of the normal appearance of the ureteral orifices, a No. 5 catheter is arrested two or three centimeters from the orifice. This indicates that the ureter is being compressed or invaded by cancerous infiltration. When, in such cases, the catheter is left in place for a few moments and there is no escape of urine, a complete obliteration of the ureter is indicated, with exclusion of the kidney.

In a case observed in the service of Pozzi, a patient with cancer of the uterus did not in the least suspect anything abnormal with the kidney, for she had never felt anything wrong in this connection; nevertheless, there was an obliteration of one of the ureters which was bringing about a complete functional destruction of one of the kidneys.

On the other hand, when the catheter suddenly produces a copious flow of urine, after having progressed with difficulty for a few centimeters into the ureter, we are dealing with hydronephrosis due to a partial obliteration of the ureter.

Estimation of the Capacity of the Kidney Pelvis.—Under the circumstances just referred to,—as I have recommended since 1906,[1] —an investigation should be made of the extent of the hydronephrosis, by determining the capacity of the renal pelvis; this re-

veals the amount of destruction of the corresponding renal parenchyma. This estimation of the pelvic capacity (the directions and technic of which are described later on) is made by injecting sterilized water into the pelvis by means of a ureteral catheter syringe. When the pelvis becomes distended, the patient feels a well-defined lumbar pain which is absolutely characteristic. A note is then made of the quantity of fluid that has been injected. A normal pelvis contains about 5 c.c.; when more than 10 c.c. can be injected, hydronephrosis undoubtedly exists.

From the cystoscopic examination practiced in a methodical manner upon all patients with cancer of the uterus, important conclusions can be drawn. With this object in view, we have examined thirty-three patients with uterine epithelioma, in the service of Pozzi, with the following results:

The bladder was normal in seven cases; i. e., Nos. 3, 12, 17, 19, 20, 22, 31. Among these seven cases, one is especially instructive,—case No. 20, in which the cancer had involved the posterior portion of the uterus especially, leaving the anterior portion unaffected.

The bladder was involved, the fundus being slightly inflamed in thirteen cases; i. e., Nos. 1, 2, 4, 9, 13, 16, 21, 23, 24, 26, 28, 29, 33.

The bladder was invaded by the cancer and presented, not only bullous edema over the entire fundus, but also a distinct elevation of the floor, in thirteen cases; i. e., Nos. 5, 6, 7, 8, 10, 11, 14, 15, 18, 25, 27, 30, 32.

In one case, No. 14, a vesicovaginal fistula was noted.

In one case, No. 25, we observed a compression of the ureteral orifices with distinct and important effect on the kidney. This case is an important one, for this complication might pass completely unnoticed if proper care is not observed in the matter. The conclusions resulting from the cystoscopic examinations in these cases are as follows:

Conclusions.—1. Bladder cystoscopy should be performed in all cases of uterine cancer, not only from the standpoint of operative prognosis, but also as an indication or contraindication for surgical intervention.

2. If the bladder is free from all lesions or presents only a diffused redness or a slight bloody suffusion, operation is indicated and will not be difficult.

3. If the bladder is somewhat involved, if little ulcerations of the mucosa and well-marked vascularization are observed, the surgeon may expect that abdominal hysterectomy will be a difficult matter.

4. If, finally, the bladder is decidedly attacked by edema or by can-

cer itself, or by a vesical perforation, these must be considered as a contraindication to abdominal hysterectomy which can only be done with extensive resections of the vesical wall.

5. If the ureters have become impermeable through ureteral compression by cancer of the uterus, or if they become invisible because of the accompanying edema, operation is absolutely contraindicated.

The following observations, the result of experience in the service of Pozzi at the Broca Hospital, have been published in greater detail in the thesis of M. Colaneri:[2]

CASE 1.—Widow B., aged forty-five.

Examination of the Uterus.—Neck ulcerated, irregular, jagged, indurated, bleeding easily, painful; slightly mobile.

Cystoscopy.—Fundus congested with red elevations as large as grapes, bleeding easily, indicating that the bladder is involved.

Ureteral Orifices.—The right is quite small, a No. 5 catheter shows the ureter is patent and free; the left is quite small, a No. 6 catheter enters freely.

Treatment.—Total abdominal hysterectomy. Uterus adherent anteriorly to the extreme limit of operability; uterine body separated from the neck during operation; ureters hard to find. Death the following day.

CASE 2.—F., aged forty-four.

Examination of Uterus.—Nodular, but does not bleed.

Cystoscopy.—Normal bladder capacity; fundus distinctly red; bladder is slightly affected; ureteral orifices normal; catheterization normal.

Treatment.—Usual; complete vaginal hysterectomy. Went home in three weeks.

CASE 3.—T., aged fifty-one.

Cystoscopy.—Bladder and ureteral orifices normal; on the left side, a No. 6 catheter is arrested slightly at 3 centimeters, but passes higher up, though with some difficulty.

Treatment.—No operation; went home.

CASE 4.—V., aged fifty-two.

Cystoscopy.—The fundus is markedly congested and bleeds at the slightest contact. Ureters are free; bladder is involved. Passed from observation.

CASE 5.—Z., aged fifty.

Cystoscopy.—The right fundus presents a few edematous masses near the right ureter; both ureters are small, but permeable to No. 5 catheters. The bladder is involved.

Treatment.—No operation; patient left the hospital.

CASE 6.—D., aged forty-three.

Cystoscopy.—Bladder capacity normal; at the fundus in the median line are found a hard elevation, hyperemia, congested mucosa with whitish vegetations which bleed at the slightest contact; on the lateral portions are edematous masses varying in size from a hemp seed to a large pea. These masses cover a large part of the fundus and completely conceal the orifices of the ureters, which therefore can not be catheterized. The bladder is involved.

Treatment.—No operation; went home in fifteen days.

CASE 7.—C., aged forty-one.

Examination of Uterus.—Ligneous infiltration of two-thirds of the vaginal circumference; neck effaced.

Cystoscopy.—Edematous globules on the bladder floor; entire fundus is edematous; right ureteral orifice is normal and readily accepts a No. 7 catheter; left orifice is overhung by edematous masses which conceal it and make catheterization impossible.

Treatment.—Warm air; no operation; died a year later.

CASE 8.—M., aged forty-one.

Examination of Uterus.—Neck is hard, very much increased in size; anterior lip overhangs the posterior; the orifice is linear, friable, and gives evidence of bloody debris.

Cystoscopy.—Bladder capacity normal; on the fundus and the median line are large, transverse swellings of glossy edema; the remainder of the fundus has a granular aspect; the bladder is involved; the right ureteral orifice accepts a No. 6 catheter; the left is surrounded with a placque of leucoplakia but easily accepts a No. 7 catheter.

Treatment.—Complete abdominal hysterectomy; no marked adhesions; slight bleeding; died the following day.

CASE 9.—B., aged forty-two.

Examination of Uterus.—Enormous neck, hardened; uterus retroverted.

Cystoscopy.—A diffused, generalized edema covers the fundus; the bladder is involved; ureteral orifices are small; double catheterization is easy.

Treatment.—No operation; hot-air applications; went home a month later.

CASE 10.—H., aged thirty-six.

Examination of Uterus.—Neck ulcerated and bleeding; uterus immobilized.

Cystoscopy.—The fundus is involved in glossy bullous edema, which bleeds at the slightest contact; urine is clear; the bladder is involved; right ureter is somewhat swollen; a No. 6 catheter passes easily; the left is surrounded by masses of bleeding edema; catheterization is impossible.

Treatment.—No operation; left ten days later.

CASE 11.—B. M., aged thirty-four. Clinically, epithelioma of uterus.

Cystoscopy.—The fundus presents numerous edematous globules with hemorrhagic spots; bladder is involved; ureteral orifices can not be seen. No treatment.

CASE 12.—C. M.

Cystoscopy.—Urine is clear; bladder normal, with normal capacity; fundus and ureteral orifices normal; the left is simply a little elevated and enlarged.

CASE 13.—T. J., aged twenty-eight.

Examination of Uterus.—A vegetating tumor, which occupies both lips of the neck, irregular, embossed, resting on an indurated base; the tumor is extending toward the left lateral cul-de-sac, where the uterus is fixed, though movable elsewhere; bloody debris.

Cystoscopy.—Bloody ecchymoses at the neck; fundus is distinctly red; between the ureters is a clearly defined inflammatory redness; the bladder is involved; ureteral orifices are normal, with feeble but normal emissions.

Treatment.—Oct. 16, 1908, curettage; cauterization. Nov. 10, 1908: Total abdominal hysterecomy; dissection of ureters adherent to the parametrium and uterus; they had to be dissected with the knife; separation from the bladder difficult. Recovery in five weeks.

CASE 14.—G., aged thirty-three.

Examination of Uterus.—Vaginal fundus indurated; cancerous buds, bleeding easily; vesicovaginal fistula invisible, but probably situated at the left in the midst of the most numerous fungosities.

Cystoscopy.—Urine is cloudy; no bladder capacity because of the vesicovaginal fistula; the fundus is invaded by the neoplasm and by numerous globules of edema; the bladder is greatly involved, except the roof, which is normal; ureteral orifices concealed by the fungoids which surround them.

PLATE XIII

FIG. 1.—*Appearance of a ureteral orifice in pregnancy.* The ureteral orifice, displaced by the fetal head, is situated higher than in the normal state; laterally a long passage which represents the right lateral side of the bladder is seen.

Fig. 2.—*Normal appearance of a ureteral orifice* seen with the direct vision cystoscope, and isolated in the lumen of the cystoscopic tube.

FIG. 3.—*Ureteral emission of normal urine* as seen with the direct vision cystoscope.

FIG. 4.—*Direct catheterization of the ureter* with the direct vision cystoscope. The fact that the catheter has penetrated well into the ureter can be verified by the double fact that it is fully surrounded with mucosa, and that the vesical mucosa is slightly puffed up around it.

FIG. 5.—*Trabeculated bladder.* Typical view.

FIG. 6.—*Urethrovesicovaginal fistula. View of the neck of the bladder.* In the upper part of the figure the floor of the normal bladder is recognized in the distance, very poorly lighted; it is surrounded by the bladder neck, which is slightly furrowed and edematous. To the right, lateral side of the vesical neck (to the left of the observer), a large oblique orifice with edematous walls is seen, through which a catheter can penetrate. This orifice leads into a passage which, turning around the right side of the vesical neck, enters the bladder at the vesicovaginal region, thus constituting a real fistula.

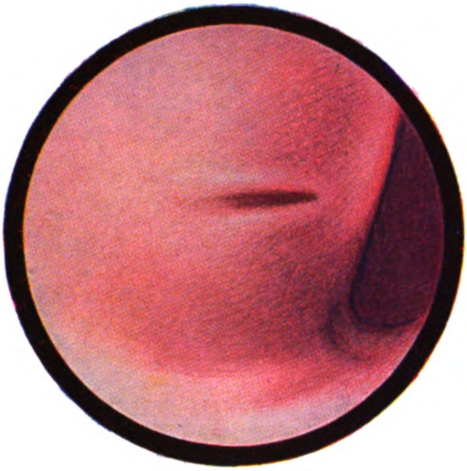

Fig. 1.

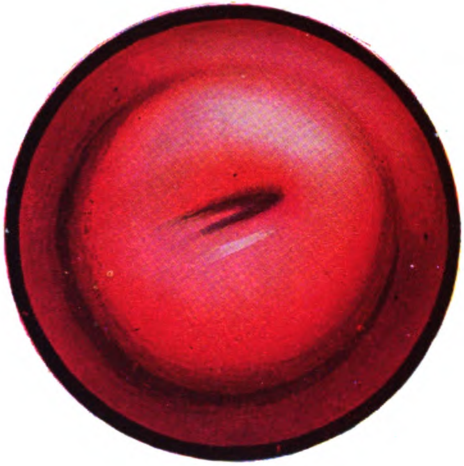

Fig. 2.

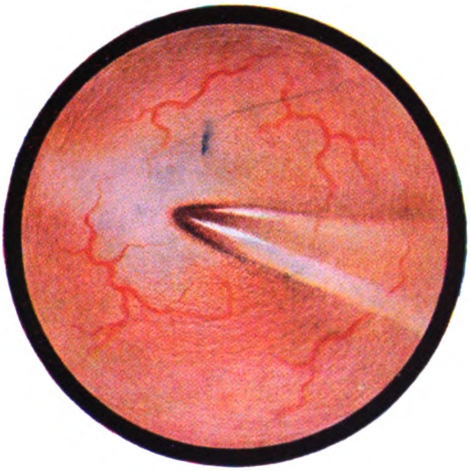

Fig. 3.

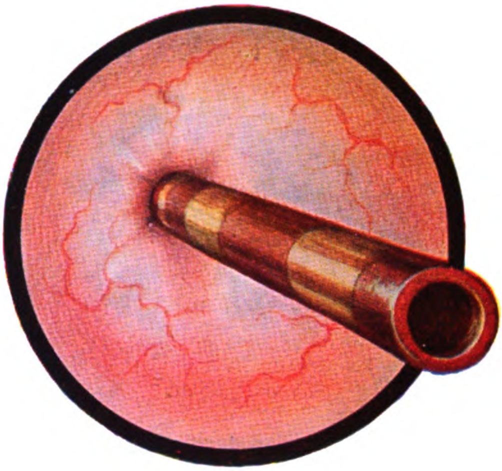

Fig. 4.

Fig. 5.

Fig. 6.

PLATE XIII

Treatment.—Two months previously, total abdominal hysterectomy had been performed, for very advanced epithelioma of the neck; the left ureter was distended behind its point of penetration in the broad ligament; further on, filiform in size and adherent to the mass. Resection of the ureter and anastomosis into the bladder where the vesical resection had been done.

Two months later: Reaching and passing beyond the affected area is impossible; lips of fistula sutured; thermocauterization of the buds. Went home four months later.

CASE 15.—C. Z., aged forty-seven.

Examination of Uterus.—Neck covered with buds; bleeding.

Cystoscopy.—A band of edema is clearly seen on the interureteral muscle (ligament) half a centimeter in length; also some edematous masses no larger than a hempseed. The bladder is involved.

Treatment.—Curettage and cauterization; went home a month later.

CASE 16.—D. J., aged twenty-eight.

Examination of Uterus.—Neck irregular and hard, especially the anterior lip; uterus not increased in size, slightly mobile; cul-de-sac negative.

Cystoscopy.—Within the left ureteral orifice, which is normal, there are a few detached globules of edema the size of a millet grain, upon an abnormally red base; the bladder invasion is extremely limited and in its incipiency.

Ureteral Orifices.—The right is normal; the left has some edematous masses around it; emissions normal; urine is clear.

Treatment.—Total abdominal hysterectomy. Easy dissection of the ureters and bladder, the latter very adherent. Went home one month later.

CASE 17.—R., aged sixty-five.

Examination of Uterus.—Painful; the neck forms a crater with torn and bleeding edges; uterus is immobile.

Cystoscopy.—The mucosa of the fundus is contracted and in folds, but appears normal; no edema; the right ureteral orifice is normal; the left shows some light false membranes; urinary secretion is the same on both sides, this being verified by the use of the separator (Luys).

Treatment.—No operation. Went home two months later.

CASE 18.—L. J., aged forty-six.

Cystoscopy.—The urine is cloudy; the fundus is edematous in parallel grooves and bleeds easily; it is elevated *en masse,* so that the cystoscope must be depressed considerably to enter the bladder. The bladder is therefore involved; only the roof is normal, and shows no abnormal vascularization; the ureteral orifices are invisible, being hidden by the edema, which has spread out over the entire fundus. No treatment.

CASE 19.—P., aged forty-seven. A characteristic uterine neoplasm.

Cystoscopy.—The urine is clear; the bladder and ureteral orifices are normal. Case not followed up.

CASE 20.—V., aged forty. Six months previously underwent removal of the neck of uterus because of ulceration. After this operation a fetid discharge and pain persisted. Manually, it was found that the posterior lip of the neck was completely ulcerated and that the obstruction reached the rectovaginal wall. In addition, hard masses could be felt in the broad ligament. Uterus, immobile. This examination showed that the anterior aspect of the uterus was not involved, but that the cancer had developed particularly along the posterior surface of the organ.

Cystoscopy.—The bladder is quite normal; the fundus but slightly reddened; ureteral

orifices entirely normal. In this case, therefore, the cancer had invaded the posterior portion of the uterus, leaving the anterior portion unattacked. Both examinations, manual and cystoscopic, agreed in the findings. This patient was not operated on, and death followed two months later.

CASE 21.—R., aged thirty-nine. Clinically, a neoplasm of the neck of the uterus.

Cystoscopy.—The fundus is slightly inflamed, especially on the right side; right ureteral orifice is not well defined; it has torn and red edges. Case not followed up.

CASE 22.—F., aged forty-three.

Examination of Uterus.—Neck fungous; culs-de-sac invaded.

Cystoscopy.—Urine is clear; the bladder is normal and has normal capacity; ureteral orifices also normal.

Treatment.—No operation; hot-air applications; curettage. Went home.

CASE 23.—S., aged forty-eight.

Examination of Uterus.—Large neck with indurated areas; uterus is mobile; the broad ligament does not seem to be involved.

Cystoscopy.—The fundus is normal except for some small elevations resembling grains of sand, which are usually met with in chronic cystitis. The roof of the bladder, on the other hand, presents numerous bright red spots about the size of a dime, and resembling purpura. The ureteral orifices are normal.

Treatment.—Total abdominal hysterectomy; dissection of the anterior uterine wall up to the vaginal cul-de-sac; severe hemorrhage followed; difficult hemostasis. Went home two months later.

Examination three years after operation: The purpura has disappeared; the bladder is normal.

CASE 24.—B., aged thirty-four.

Examination of Uterus.—In the vagina, an enormous mass, budding and hard; the culs-de-sac are completely invaded, especially the right.

Cystoscopy.—The urine is slightly hazy; bladder capacity normal; the right fundus is slightly elevated; on the same side are edematous masses, some of which are ulcerated, this being an indication of bladder involvement; both ureteral orifices are in contact with these masses.

Treatment.—Curettage and cauterization. Went home.

CASE 25.—D., aged sixty.

Cystoscopy.—The trigone is invaded with a red tissue, with whitish ulcerated buds and bleeding easily; the urine is cloudy and the bladder is invaded; the right ureteral orifice is barely visible in the midst of neoplastic tissue; catheterization is impossible; the right kidney is plainly increased in size; the left ureteral orifice is normal.

In this case there was a distinct contraindication to operation.

CASE 26.—F. S., aged thirty-one.

Examination of Uterus.—The neck is vegetating and bleeding.

Cystoscopy.—The trigone is bright red and elevated; slight elevations, somewhat paler, stand out prominently against a background of hemorrhagic spots; the bladder is but slightly invaded; the ureteral orifices are normal.

Treatment.—Curettage and cauterization. Went home.

CASE 27.—L., aged forty-five. Neoplasm of the uterine neck.

Cystoscopy.—The urine is clear; the fundus presents an intense generalized edema, contrasting with the glossy whiteness of the normal roof of the bladder; the bladder is undoubtedly invaded and painful; the ureteral orifices are invisible. No treatment.

CASE 28.—H., aged sixty-one. Cancer of the uterine neck.

Cystoscopy.—The urine is clear; the bladder floor is highly vascularized, gathered in folds and adherent, resembling the intestinal mass; the bladder is evidently involved; ureteral orifices are normal. No treatment.

CASE 29.—B., aged forty-two.

Examination of Uterus.—Neck situated rather high up, hard and sclerotic; on the anterior lip are many buds, separated one from another by ulcers which bleed very easily; culs-de-sac free, except at the left, where there is a slight thickening.

Cystoscopy.—The bladder capacity is normal; it is slightly invaded by neoplastic infiltration; the trigone is slightly elevated and presents a hemorrhagic spot; the ureteral orifices are normal; nothing from the bladder point of view seems to contraindicate operation.

Treatment.—Complete abdominal hysterectomy; the left adnexa adherent; isolation of the ureter; separation of the bladder and dissection by scissors of the lower extremity of the ureters. Went home seven weeks later.

CASE 30.—B., aged forty-four.

Cystoscopy.—Urine is cloudy; the bladder capacity is 10 c.c.; the fundus is markedly edematous; the bladder is affected; the right ureteral orifice is invisible in the midst of the edema.

CASE 31.—L., aged forty-nine. Cancer of the uterus. Has been referred to determine whether the bladder is involved.

Cystoscopy.—The bladder is normal, but presents numerous trabeculations; the ureteral orifices are normal.

CASE 32.—B., aged thirty-eight. Operated on by Robineau, by the vaginal route, for an epithelioma of the uterine body.

Cystoscopy.—Diffuse infiltration of the vesical mucosa at the fundus; behind the fundus, highly edematous folds of the vesical mucosa are seen, which give the appearance of a large edematous cushion; the entire left side of the bladder is normal; two little transparent cystic vesicles are seen on the left lateral portion of the vesical neck; the ureteral orifices are normal.

Treatment.—Local treatment of the bladder by applications of strong resorcin, with the direct vision cystoscope.

CASE 33.—K., aged fifty-two. Referred to determine whether she has a neoplasm in the bladder.

Cystoscopy.—The bladder has a capacity of 150 c.c.; the urine is clear; the fundus is slightly infiltrated, congested and downy; the ureteral orifices are normal; the bladder is, therefore, but slightly involved.

REFERENCES

[1]Luys: De la mesure de la capacité du bassinet, Ann. d. mal. d. org. génito-urin., 1906, ii, p. 519.

[2]Colanéri, X.: De la valeur de l'examen de la vessie dans le cancer de l'uterus, Thése, Paris, Steinheil, Editor, 1913.

CHAPTER VI

DIRECT VISION CYSTOSCOPY

Direct vision cystoscopy is the study of the vesical mucosa under the direct control of the eye without the aid of the prism or of any special optical apparatus.

Under this head we shall consider: 1. The conditions necessary for the study of direct vision cystoscopy. 2. The technic. 3. The advantages. 4. The disadvantages of this method.

CONDITIONS NECESSARY FOR DIRECT VISION CYSTOSCOPY

In order to see an object well in all its details, it is essential that (1) it should be well illuminated; (2) it should be well isolated from the surrounding portions; (3) its surface should not be covered over by any fluid so that there may be a homogeneous medium between the eye and the object, without change of the index of refraction; and (4) the smallest details should be distinguishable.

Bearing these conditions in mind, there are four essentials to a good view of the vesical mucosa, as follows: 1. Proper illumination. 2. Distention of the vesical walls. 3. Aspiration of the urine as fast as it enters the bladder. 4. Magnification of the image.

1. **Proper Illumination.**—It goes without saying that an internal source of illumination, brought as closely as possible to the object to be examined, is by far the most desirable method at our command. I have made a series of experiments in order to assure myself of this fact. Holding a simple tube vertically, I projected into it the rays from a very powerful electric light situated outside of the tube. I thus obtained an illumination which gave a moderately good view at the lower end of the tube. On the other hand, I placed a very small lamp at the point to be examined, and obtained a very fine illumination, more intense than previously. It was quite natural to expect that this arrangement would furnish a much better illumination than that provided by an external source, such as a frontal head lamp, for example.

For the illumination of my cystoscope, I then adopted the principle of the small electric lamp situated at the vesical extremity of

the cystoscopic tube. I have contributed the following improvements to this method of illumination:

The lamp is very small while its luminous intensity is superior to those formerly used; not only does it illuminate the portion of the mucosa which is in direct contact with the extremity of the tube, but it also projects luminous rays beyond the tube. When the bladder walls are distended, with the patient in the inclined position, they are fully illuminated, so that a distinct and clear-cut examination of the entire bladder is made possible. (Figs. 149-150.)

The lamps, mounted on fine rods, are very easy to handle, and can be changed in a few seconds.

They are attached to a metallic cap, filled with a nonconducting material, so that fluid can not penetrate and thus produce a short circuit.

They have a voltage of two volts, and when new, are absolutely "cold." They can be kept lighted between the fingers without any appreciable heat being felt.

2. **Distention of the Vesical Walls.**—This may be attained by elevating the bladder region so that the abdominal contents may drop towards the diaphragm. In this position, a vacuum is formed in the lesser pelvis; the hypogastrium is retracted, causing this vacuum. Therefore when an empty tube is inserted into the bladder, the air rushes in and fills it completely, thus causing dilatation of the viscus.

This method is preferable to that of injecting air into the vesical cavity under pressure. The latter method, recommended for more than ten years by Nitze, has been completely abandoned since then by its author, on account of its many disadvantages.[1]

In order to elevate the bladder and cause its distention, two procedures may be adopted:

Kelly and other American surgeons place the patient in the genu-pectoral position; but this position is fatiguing to the patient and uncomfortable for the surgeon. It seems more practical to place the woman in the Trendelenburg position, for example, and supporting her shoulders. The idea of using shoulder props to sustain the weight of the body and permitting a comfortable gynecologic examination in the inclined position, was first suggested by Jayle, in 1897.[2] It is but an act of justice to term this position the "inclined position of Jayle."

It may be said that the vesical wall is readily distended when the bladder is normal or not seriously diseased, or when the patient is not too obese; but when the fundus is inflamed and the vesical walls are contracted, the distention is far from satisfactory. When the cysto-

scope is properly handled, however, the entire mucosa can be examined.

Satisfactory distention of the bladder is obtained by having the patient breathe with the chest only, and not with the abdomen; that is,

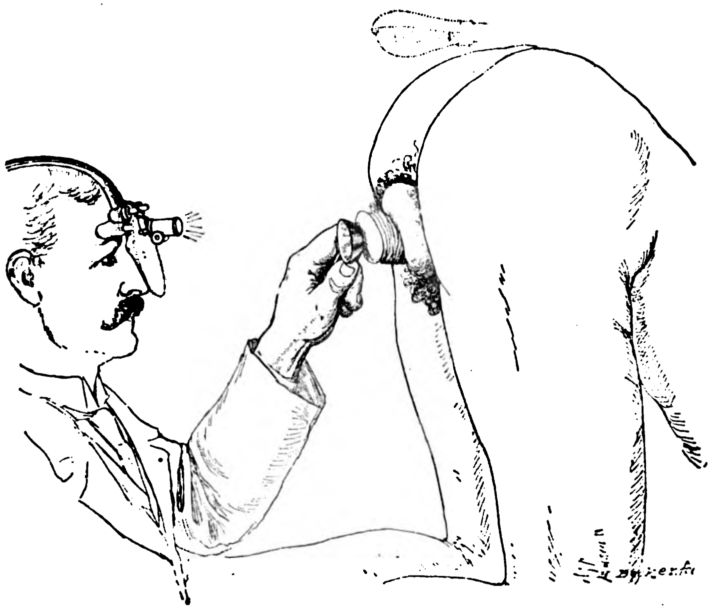

Fig. 138.—Genupectoral position adopted by Kelly for endoscopic examination in the male (Kelly).

to have the patient use the superior costal muscles and not the diaphragm. During the costal inspiration, the abdomen retracts and favors the dilatation of the bladder. On the other hand, during dia-

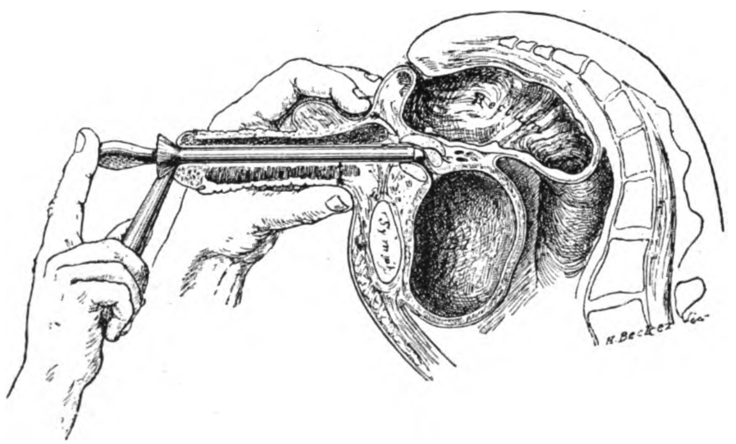

Fig. 139.—Method of introduction of Kelly's endoscopic tube in the male (Kelly).

phragmatic inspiration, the intestinal mass is pushed downward and actually prevents vesical distention. Perfect dilatation can, there-

fore, be secured by instructing patients as to their respiration before the examination.

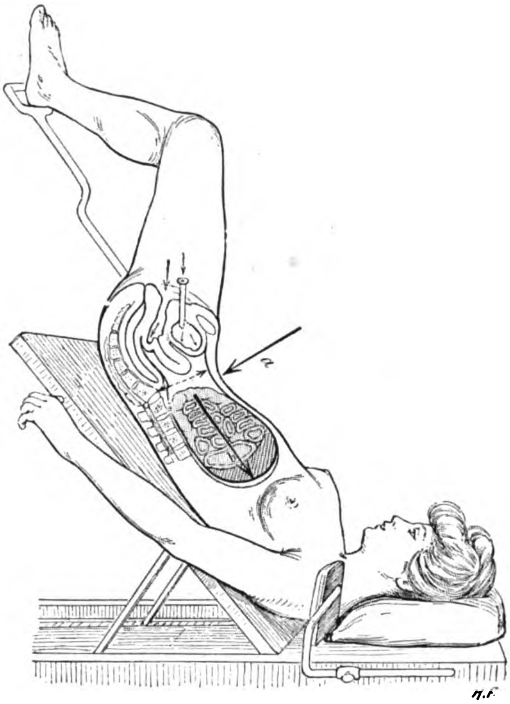

Fig. 140.—In the inclined position, the intestinal mass is drawn toward the diaphragm in the direction of the arrow *B*, but not backward because of the presence of the vertebral column.

In certain very obese patients even under chloroform anesthesia, vesical distention is obtained only under great difficulty in the reclin-

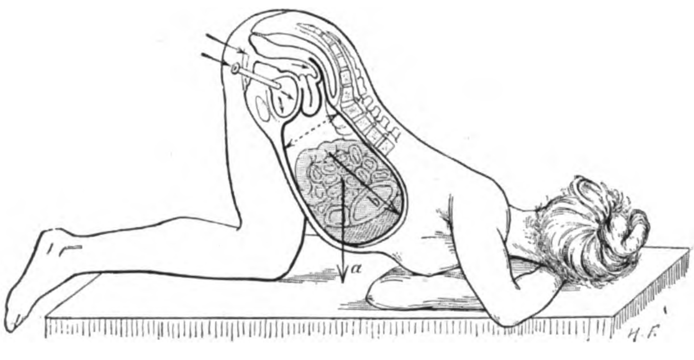

Fig. 141.—In the genupectoral position, the intestinal mass is not only drawn toward the diaphragm in the direction of the arrow *B*, but also forward in the direction of the arrow *A*. The free space indicated by the double arrow ⟵——⟶ is much greater in this position than in the preceding one.

ing position because of the abdominal plethora. In such cases, the genupectoral position recommended by Kelly may have to be adopted.

It must be admitted in this connection, that the dilatation of the bladder is greater in this position than in the reclining position (Figs. 138-139).

In the genupectoral position, the intestinal mass has two directions of movement which permit the dilatation of the bladder,—one forward, at the expense of the supple abdominal wall and without opposition, and the other upward, in the direction of the diaphragm. In the inclined position, on the other hand, the intestinal mass has but one way of escape, i. e., toward the diaphragm. The vertebral column as compared with the abdominal wall, is fixed in its position, and can

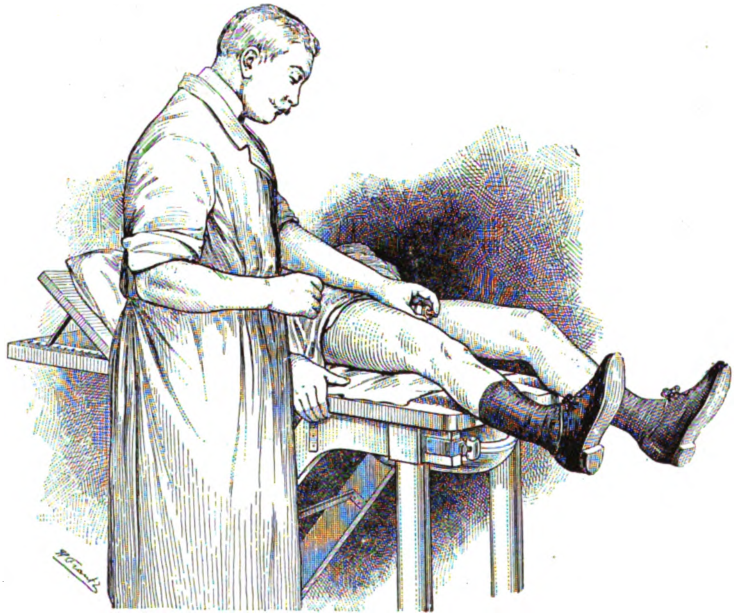

Fig. 142.—First step in the examination of the bladder in the genupectoral position in the male. The cystoscopic tube is first introduced with its elbowed obturator, while the patient is in the horizontal position; this having been done, the patient is asked to turn over gently and place himself in the genupectoral position (see Fig. 143).

not undergo any displacement. We may therefore say that the genupectoral position furnishes a more satisfactory distention of the bladder and must be resorted to when the inclined position for one reason or another, is not satisfactory.

Even in the male, when direct vision cystoscopy is indicated, but when the bladder can not be conveniently dilated in the inclined position because of extreme embonpoint, it may be well to use the genupectoral position. The latter seems at first, quite difficult to attain, but it can be done easily if we proceed methodically. The cystoscope is introduced with the patient on his back (Fig. 142); then, the surgeon hold-

ing the instrument *in situ,* the patient is requested to turn over very slowly, placing himself finally in the genupectoral position, as shown in Fig. 143.

In one instance, this maneuver was especially useful to one of my patients. The left kidney had been removed for tuberculous pyonephrosis. After the operation, vesical lesions persisted with symptoms of marked cystitis. Indirect cystoscopy showed two plaques of tuberculous cystitis circumscribed clearly on the upper bladder wall. I placed him in the genupectoral position and obtained an excellent dilatation of the bladder. With my direct vision cystoscope I saw the inflammatory plaques on the upper wall (Plate XVI, Figs. 2 and 3), and

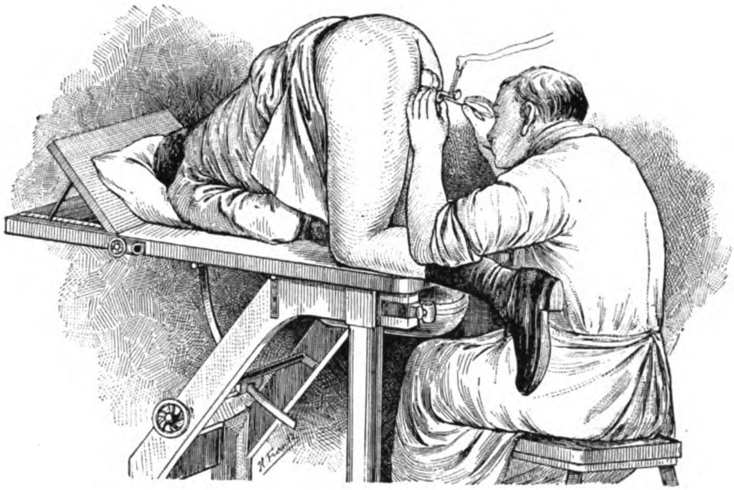

Fig. 143.—Local treatment of cystitis in the male, in the genupectoral position.

was enabled to make direct applications of lactic acid solution which resulted in a decided improvement.

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[1]Nitze: Lehrbuch der Kystocopie, 1889, pp. 80, 81.
[2]Jayle: Presse med., June 22, 1898, p. 336; also Feb. 15, 1899, No. 13, p. 79; Rev. de gynéc. et de chir. abd., April 10, 1899, No. 2, p. 314.

3. **Aspiration of the Urine.**—The constant secretion of urine through the ureters makes it impossible to obtain a dry mucosa for a proper examination. The urinary secretion takes place so quickly that it is difficult to make an examination between the applications of the swab. It is therefore necessary to establish continuous aspiration of the urine. Kelly has devised an aspirator consisting of a rubber bulb which communicates by means of a rubber tube with a small silver perforated

ball. This aspirator is introduced into the cystoscopic tube, thus further narrowing the lumen of the tube and also necessitating the presence of an assistant.

In the belief that such a special instrument is not necessary, I have

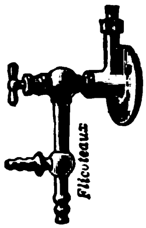

Fig. 144.—Water horn (faucet).

constructed a small gutter or trough in the inferior wall of my new tube, through which the aspiration of the urine takes place. The orifice of this channel reaches down to the vesical end of the cystoscope; externally it ends in a metallic tube to which is attached a rubber tube (Fig. 145). The latter empties into a closed jar controlled by two

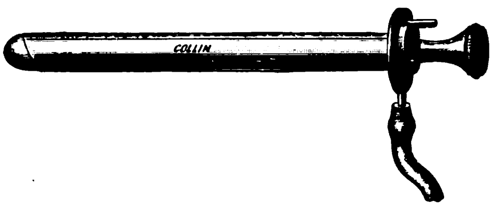

Fig. 145.—Luys' female cystoscope, with its straight obturator.

stop cocks in which a vacuum can be created. The vacuum can be established by a Potain aspirator, but this is not to be recommended because the vacuum thus created is not sufficient for the purpose. It is much more practical and even essential to use a water horn attached to a faucet (Fig. 144). On opening the faucet a vacuum is produced in

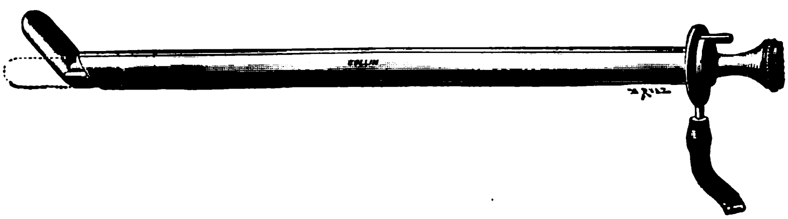

Fig. 146.—Luys' male cystoscope, with its elbowed obturator.

the jar and the urine is thus aspirated. The manipulation is very simple; aspiration is rapid and perfect, cleansing the mucosa not only of urine, but also of any mucus or blood clots which might be present.

This constant evacuation of urine is indispensable to clear vision and the examination can thus be made without interruption.

The water pressure in the faucet should be of sufficient strength; and the rubber tubing should be sufficiently firm so that it will not collapse when the vacuum is established in the jar. The latter has a two-branched glass tube leading into it. To one is attached a rubber tube which is connected with the water faucet, and to the other is connected the tube which receives the urine from the bladder through the cystoscope.

4. **Magnification of the Image.**—Magnification is obtained by the addition of a movable lens having a focal length corresponding to the length of the cystoscopic tube. This lens may be applied at the external

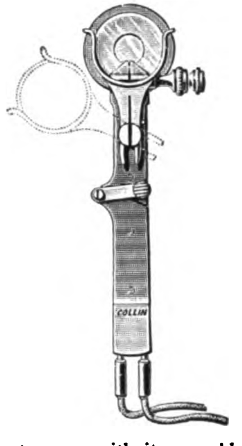

Fig. 147.—Handle of the direct vision cystoscope, with its movable lens; it is the same as the handle of the urethroscope.

orifice of the tube without in any way interfering with the introduction of instruments; when not in use, it can be rotated out of the way (Fig. 147).

DESCRIPTION OF THE DIRECT VISION CYSTOSCOPE (LUYS)

This instrument consists essentially of a metallic tube, 18 cm. long for the male, and 10 cm. long for the female. I have adopted this length for the female cystoscope, allowing four centimeters for the vulvar distance, two centimeters for the urethra, and the remaining four centimeters for the bladder proper. The caliber of the tube selected varies according to the caliber of the urethra, which, according to Kelly, varies from six millimeters (minimum) to twenty millimeters (maximum). According to Simon, the maximum dilatability of the female urethra is a little more than 29 centimeters.

It is usually sufficient to use a No. 26 Charrière tube, but if the

urethra is normal, a larger tube may be used, as it will provide a much larger field of vision. As often as circumstances permit, I use a 29.5 Charrière tube in either sex.

As previously mentioned, there is a very minute channel or gut-

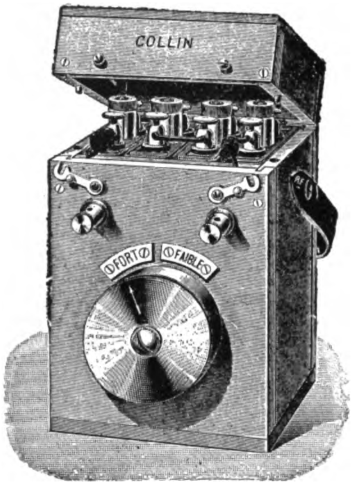

Fig. 148.—Collin's group of batteries.

ter in the floor of the urethroscope; this does not impinge on the lumen of the tube. It is connected with the vacuum jar by means of a rubber tube. There is another little gutter on the upper wall, parallel with

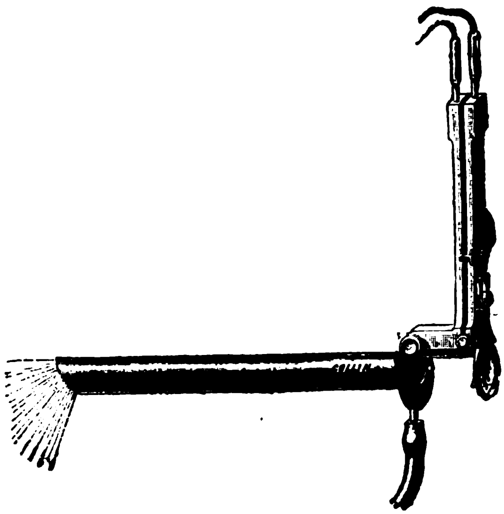

Fig. 149.—Luys' direct vision cystoscope for the female.

the lower, for the lamp carrier, so as not to obstruct the tube's lumen.

The tube is introduced with the aid of a straight obturator (Fig. 145) for the female cystoscope, and an elbowed obturator for the male

(Fig. 146). The elbowed portion projects beyond the tube into the bladder for three centimeters, and can be straightened or bent by means of a screw. The bend in the obturator facilitates the introduction of the instrument into the bladder. As soon as it has been introduced, the obturator is straightened and withdrawn from the bladder. Illumination is furnished by a miniature electric lamp, described above (page 46). It is extremely brilliant considering its small size, and absolutely "cold," especially when new. Unfortunately, as the lamps grow old, they require a greater current and consequently produce more heat, which constitutes a decided disadvantage. It is advisable

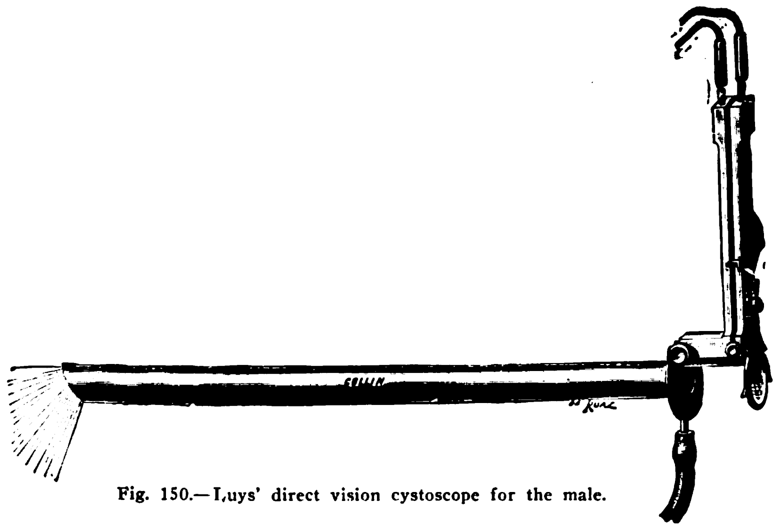

Fig. 150.—Luys' direct vision cystoscope for the male.

in actual practice, to use only such lamps as are absolutely cold, rejecting those which show evidences of getting warm.

The lamp is carried on a long stem attached to the handle of the cystoscope. The latter is provided with an interrupter and receives the conducting wires of the electric current. It carries in addition, a demountable magnifying lens, situated in a movable frame. Its focal length corresponds to the length of the tube. The lens, as already mentioned (page 45), may be constructed with an aperture in its center, thus making it unnecessary to move it aside when making local applications to the vesical mucosa.

The handle is firmly fastened to the tube by means of a screw. The source of the electricity varies according to the place where the instrument is used. Undoubtedly the street current is the most desirable and practical, but the high voltage must be reduced by the employment of a rheostat (Figs. 46 and 47).

PLATE XIV

FIG. 1.—*Chronic cystitis.* Aspect of the fundus resembling grains of sand. In front, the interureteral ligament is seen; posteriorly, on another plane, chronic cystitis is visible in the form of grains of sand, and still further back, healthy mucosa.

FIG. 2.—*Vesical herpes.* The right ureteral orifice is seen, and near it, disseminated herpetic plaques, transparent, and resembling bubbles.

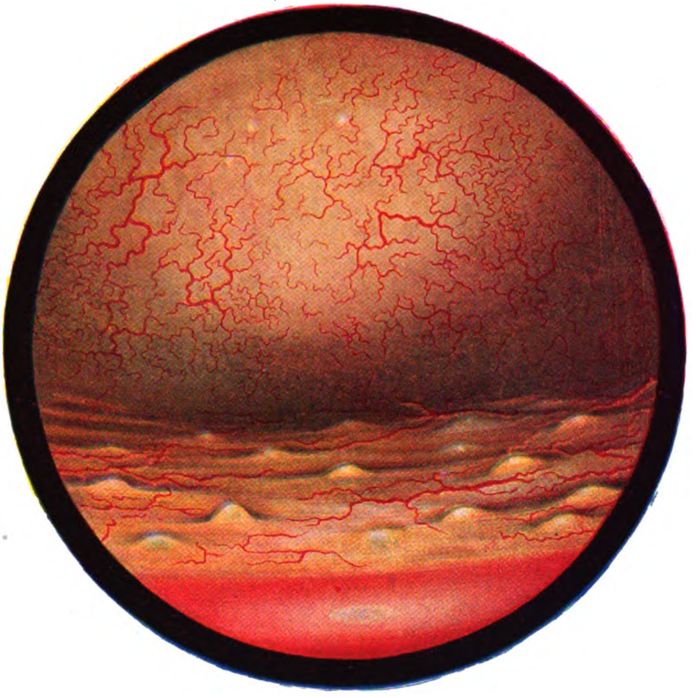

Fig. 1.

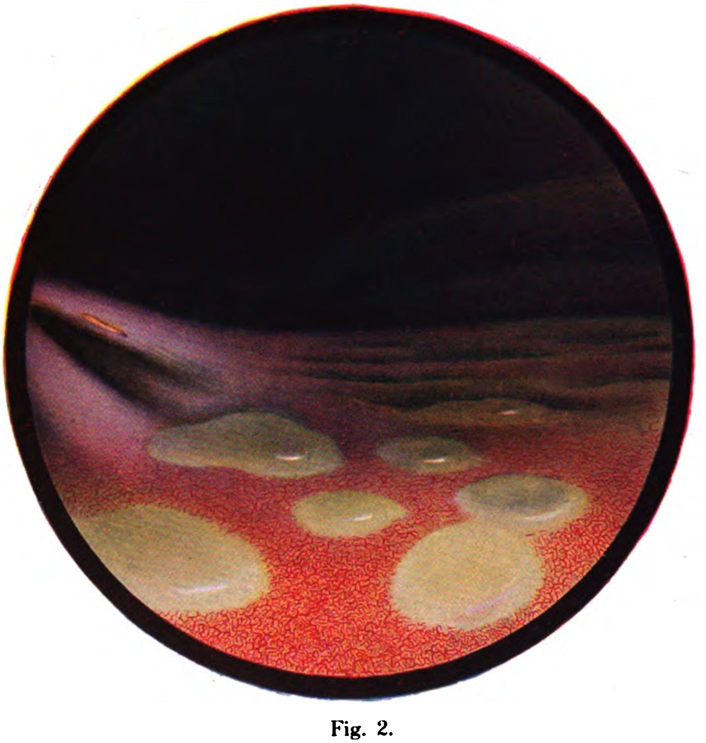

Fig. 2.

PLATE XIV

TECHNIC OF DIRECT VISION CYSTOSCOPY

Preparation of the Instruments.—The instruments should be sterilized. The cystoscopic tube and its obturator can be boiled in water; the lamps are sterilized in a trioxymethylene (paraform, formalin) sterilizer. The vacuum apparatus is tested to see that it works prop-

Fig. 151.—Tampon of cotton mounted on a wooden applicator.

erly; likewise the lamps and the electric current. Wooden applicators capped with sterile cotton should be within easy reach on a table (Fig. 151).

Preparation of the Patient.—The patient is undressed except for his shirts. The bladder is washed with a catheter, syringe or irrigator,

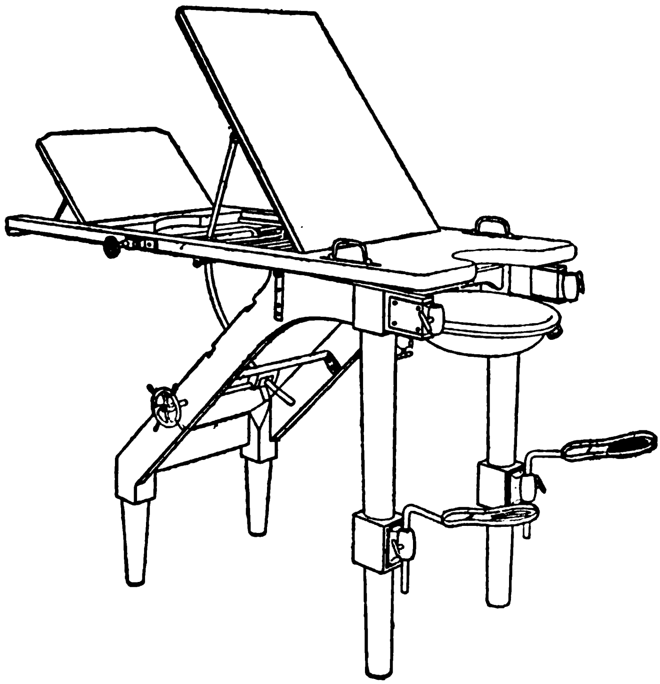

Fig. 152.—Table specially built according to my directions for urinary examination, horizontal position.

until the washings come out quite clear; the bladder is now emptied completely. The patient is placed in the partial Trendelenburg position, the buttocks resting on the edge of the table. Adjustable shoulder supports help to maintain the patient in the proper position. The feet rest in the stirrups with the legs well separated. For examination of the bladder fundus or for catheterization of the ureters, the buttocks

should not be elevated too much. On the other hand, the roof of the bladder is better inspected when the thighs are well elevated. The head may rest on a little pillow.

In acute painful cystitis or in sensitive patients, a local anesthetic should be employed. Ten to 20 c.c. of a sterile 1 per cent solution of stovaine may be used. Bransford Lewis, of St. Louis, deposits little tablets containing 5 to 10 per cent of cocaine into the posterior urethra by means of his tablet depositor. According to this author, anesthesia

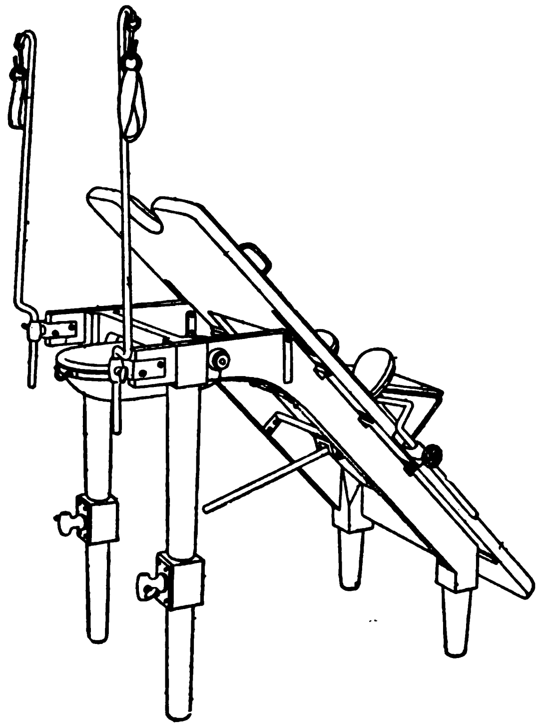

Fig. 153.—Table specially built according to my directions for examination with direct vision cystoscope.

of the bladder can be produced more easily by this ingenious method than by any other.

Half an hour before the examination, a solution containing twelve drops of laudanum and one or two grams of antipyrin may be deposited in the bladder for anesthesia. In extremely painful cases, anesthesia may be produced by the subcutaneous injection of scopolamine, according to the technic described by Terrier;[1] also by an injection of morphine, or in extreme cases, through the use of a general anesthetic.

REFERENCE

[1]Terrier: Bull. de Soc. de Chir., 1905, p. 347.

Operative Technic

Introduction of the Cystoscope in the Female.—If a rather large cystoscopic tube has been chosen, a No. 29.5 for example, it is well to dilate the urethra first, either with Kelly's meatus dilator or by the passage of Hegar's sounds, Nos. 6, 7, 8, and 9. This facilitates the introduction of the cystoscopic tube. If the meatus is somewhat narrow and sensitive, it is well to insert into the urethra, before dilatation, a cotton tampon soaked in a 5 or 10 per cent solution of stovaine; this is highly recommended by Kelly, and gives excellent results.

Fig. 154.—Examination of the bladder with the direct vision cystoscope.

The cystoscope having been sterilized and lubricated with sterile glycerin, is gently inserted into the bladder. The obturator is withdrawn and when the table is elevated, it is seen that the bladder becomes filled with air.

In the Male: In the male, it is absolutely necessary to have a canal free from stricture, and stretched in advance by the passage of sounds up to 28-29, if possible. If this precaution has been taken, the introduction of the cystoscopic tube presents no difficulties. The instrument is introduced into the bladder with the elbowed obturator. The screw controlling the handle is released, thus straightening the obturator, and

the latter is withdrawn from the tube. The operative technic is now the same in both sexes.

The cystoscope having been inserted, the aspirator is connected, so that the bladder will be kept dry throughout the examination. Occasionally when the bladder is not well dilated, the mucosa may protrude into the interior of the tube. It is then necessary to interrupt the aspiration until a little fluid has accumulated in the bladder. The handle of the cystoscope is now fastened by a screw and the current turned on.

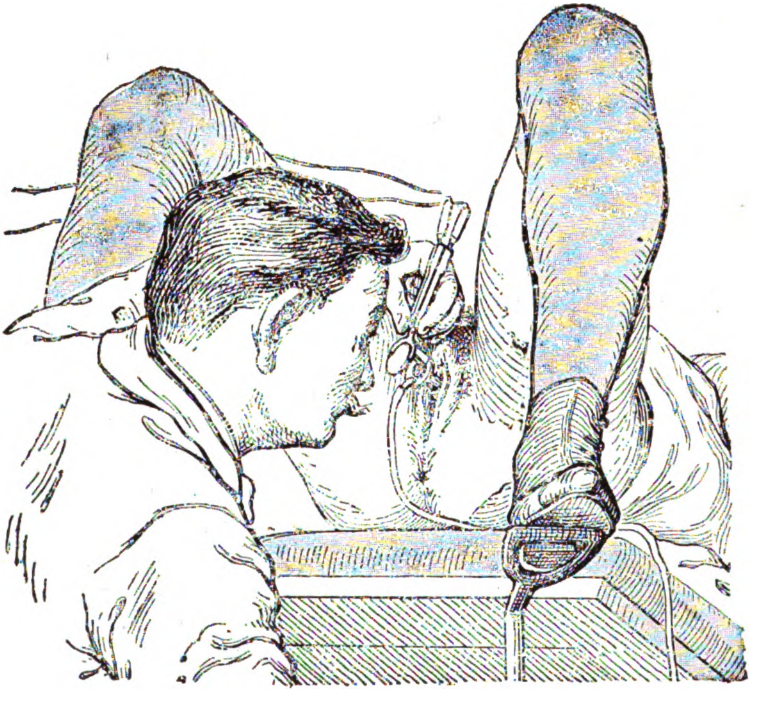

Fig. 155.—Examination of the bladder. Exact position of the direct vision cystoscope in the female.

The bladder is seen splendidly illuminated, so that every detail can be recognized. The vesical extremity of the cystoscopic tube moves freely in the bladder and can be easily manipulated in all directions, because of the distention brought about by the inclined position.

Examination of the bladder floor is quite simple. By raising the handle of the instrument, the vesical end is depressed correspondingly, thus bringing the trigone within view easily. The roof is examined by lowering the handle of the cystoscope and thus elevating its vesical extremity. It is advisable to make gentle pressure on the abdominal wall over the bladder; the entire bladder roof then comes into view in the cystoscopic tube, and no portion of the vesical mucosa can escape observation.

Abnormal Cases

In direct vision cystoscopy, petty difficulties may be encountered, particularly by a novice, the two most important being the following:

1. *The bladder does not dilate fully under the influence of the inclined position.* This may be due to several causes: (a) The patient

Fig. 156.—If the bladder does not dilate well in the inclined position, an assistant elevates the abdominal wall, thus facilitating the stretching of the bladder.

may be too stout, and the abdominal fat may prevent the bladder from distending itself and thus becoming filled with air. It is then necessary to still further elevate the pelvis. When the inclined position has been pushed to its limit, and if the bladder still does not distend itself, the following expedient may be employed, especially when the abdominal wall is flabby: An assistant grasps the abdominal wall as-

near the pubis as possible, with both hands, raising up as much of the wall as he can seize (Fig. 156). This maneuver will very often succeed in causing distention of the bladder and a perfect view of the entire vesical cavity is thus obtained. If, however, the result is still unsatisfactory, the genupectoral posture must be resorted to. (b) The patient may be thin, but resists and contracts the abdominal muscles spasmodically. This is because the patient is nervous, and requires a local anesthetic before relaxation is secured.

2. *The vesical mucosa may bleed profusely.* This renders a clear view extremely difficult and nothing but blood can be seen. The action of the aspirator is insufficient to take up a large quantity of blood, and even if it took up all the fresh bleeding, it would still be unable to remove the coat of blood which covers the fungosities in the bladder. In such cases it is necessary to swab the mucosa with little tampons of dry cotton. Occasionally however, the mere contact of these swabs actually increases the bleeding of the mucosa. The only thing to do is to use a 1:1000 solution of adrenalin. Tampons soaked with this solution are brought into contact with the bleeding points and the hemorrhage ceases.

ADVANTAGES OF DIRECT VISION CYSTOSCOPY IN EXAMINATION OF THE BLADDER

The direct examination of the vesical mucosa by the simple cystoscopic tube offers many advantages over the indirect (prismatic) method. In the normal bladder, the two principal advantages are the following:

1. **The Direct View.**—With direct vision the various regions examined are seen just as they really are, in their normal position, form, and situation, and are not deformed in any manner. The personal interpretation does not enter into consideration and no matter how inexperienced in cystoscopy the observers may be, they all see the pictures alike, because the image is not deformed or inverted. This is a decided advantage, especially in determining the volume of a stone or of a vesical tumor. In fact, in order to see well with the indirect cystoscope, it is necessary to keep the instrument at a certain distance from the object. Inasmuch as it is difficult to say what this distance should be, even a well-practiced eye may make serious errors in determining the actual size of foreign bodies in the bladder.

In making a full view examination, the direct vision cystoscope also has a decided advantage over the indirect. By inclining the tube so that its long axis is almost parallel with the surface of the mucosa

to be examined, a series of changes of the mucosa can be seen in profile which would escape unobserved when the same mucosa is looked at in full view. I have thus been enabled to observe and make sketches in numerous cases of chronic cystitis, of alterations consisting of little elevations in the form of grains of sand which can not be seen well with the indirect cystoscope.

2. **Normal Coloring of the Mucosa.**—The necessity of filling the bladder with water or air, in order to obtain a good view in indirect cystoscopy, causes a certain amount of distention which in turn, produces a condition of anemia. The real color of the mucosa is therefore not seen. On the other hand, in direct vision cystoscopy, the bladder is distended without force and the natural tints of the mucosa are seen just as they are in reality.

3. **Possibility of Examination in Contracted Bladder.**—The direct vision cystoscope permits the examination of inflamed bladders which have not a sufficiently large capacity to permit their distention by the quantity of fluid required for indirect cystoscopy. It is well known that prismatic (indirect) cystoscopy is well nigh impossible when the vesical capacity is less than 60 c.c., and gives results which are practically nil. Such instances are not at all rare; especially is this true when the ureters are to be catheterized. I shall again consider this later on.

4. **Possibility of Examination in Hematuria and Pyuria.**—In hematuria and pyuria, when examination is almost impossible in spite of the most copious irrigations, direct vision cystoscopy has a distinct advantage over the indirect method; only by this method, can we obtain the necessary and precise information in cases of profuse hemorrhage which would obstruct the field of vision in the indirect vision cystoscope. In this manner, errors which are as considerable as they are to be regretted, can be avoided.

An especially interesting case observed by me, is that of a woman aged forty years, whom I treated in 1907. She was a patient of Routier, who had referred her to me because of hematuria, and he wanted my cystoscopic opinion. Another specialist, who was previously consulted, had declared after an indirect cystoscopy, that the patient did not have a tumor of the bladder, but that she had a cyst in the lower extremity of the left ureter! When I examined her, she had well-marked hematuria. As soon as the indirect cystoscope was inserted into the bladder, whirlpools of blood prevented distinct vision and made the examination impossible. I then used my direct cystoscope and was enabled to make a positive diagnosis of a large tumor of the bladder

situated in the left lateral portion of the fundus. In view of this diagnosis, Routier had his patient enter the sanitarium two days later.

On opening the bladder, a tumor the size of a pigeon's egg was removed, and the histologic examination, made in the laboratory of Necker by Herrenschmidt, showed that the growth was a fibroma.*

5. **Possibility of Examination in Cases of Perforation or Vaginal Fistula.**—The direct vision cystoscope is the only instrument for the examination of a bladder with a fistula; such for example, as a vesicovaginal fistula. In these cases, it is manifestly impossible to distend the bladder with a fluid which it can not hold, and the only method to be employed is certainly direct vision cystoscopy.

It is superfluous to insist on the importance of the exact knowledge of the seat of the vesical perforation in vesicovaginal fistula. With the aid of my direct vision cystoscope, a probe can be introduced into the fistula which penetrates the vagina and indicates the direction of the fistula in the clearest manner. The services which this method may render in such a case, are well shown by the two following observations by Ferron:[1]

"Ferron examined a patient with a vesicovaginal fistula. A probe was introduced into the fistula through the vagina; this was followed by direct vision cystoscopy. It showed that the fistulous orifice was very near the ureteral orifice. On operation, the fistula was sutured, at the same time avoiding closure of the ureteral meatus.

"In another case, a mistake in diagnosis was rectified by direct vision cystoscopy. A woman having undergone total hysterectomy was emitting urine through the vagina. The clinical diagnosis was vesicovaginal fistula. Then Ferron employed direct vision cystoscopy; the bladder seemed perfectly normal, and while catheterization of the left ureter was easy and produced urine, it was impossible to pass even a filiform into the right ureteral orifice. The diagnosis was therefore changed to ureterovaginal fistula."

REFERENCE

[1]Ferron: In These de Chardon, la Cystoscopie à vision directe. Bordeaux, 1912, p. 47.

6. **Possibility of Examination in Urethrovesicovaginal Fistula.**[1]—If vesicovaginal fistulæ are not relatively rare in women, that can not be said to be true of cases which are complicated with another communication between the bladder and the urethra, in the form of an abnormal channel passing outside of the vesical neck from the blad-

*The specimen is to be found in our private collection.

der to the posterior portion of the urethra. In such a case, incontinence of urine seems to proceed from the vesicovaginal fistula alone, but the other vesicoparaurethral canal is none the less an interesting

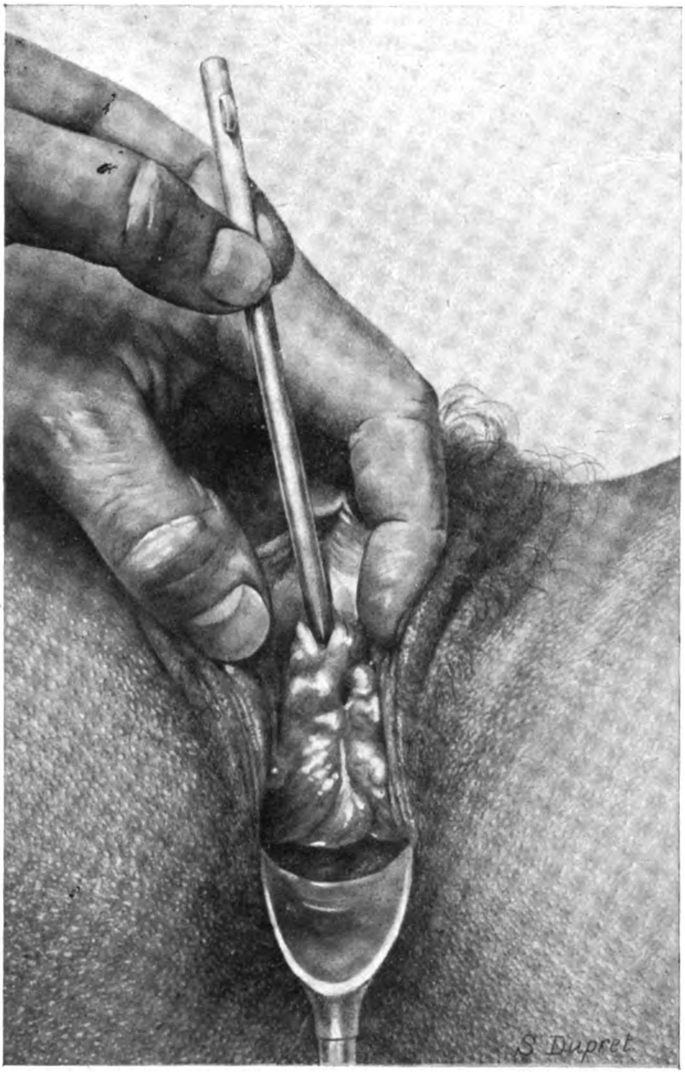

Fig. 157.—Vesicovaginal fistula. A catheter is introduced into the urethra; the opening of the fistula is seen a little below and to the right.

anatomicopathologic complication which must be taken into consideration.

These urethrovesicovaginal fistulæ have been observed but rarely, and the cases of this kind met with in literature do not resemble the one about to be described, for the urethrocystoscopic investigations

which could reveal them were not in current medical practice at that time. My direct vision cystoscope gives a clear view of the neck of the bladder quite as well on the vesical side as on the urethral, and thereby facilitates the investigations considerably.[2]

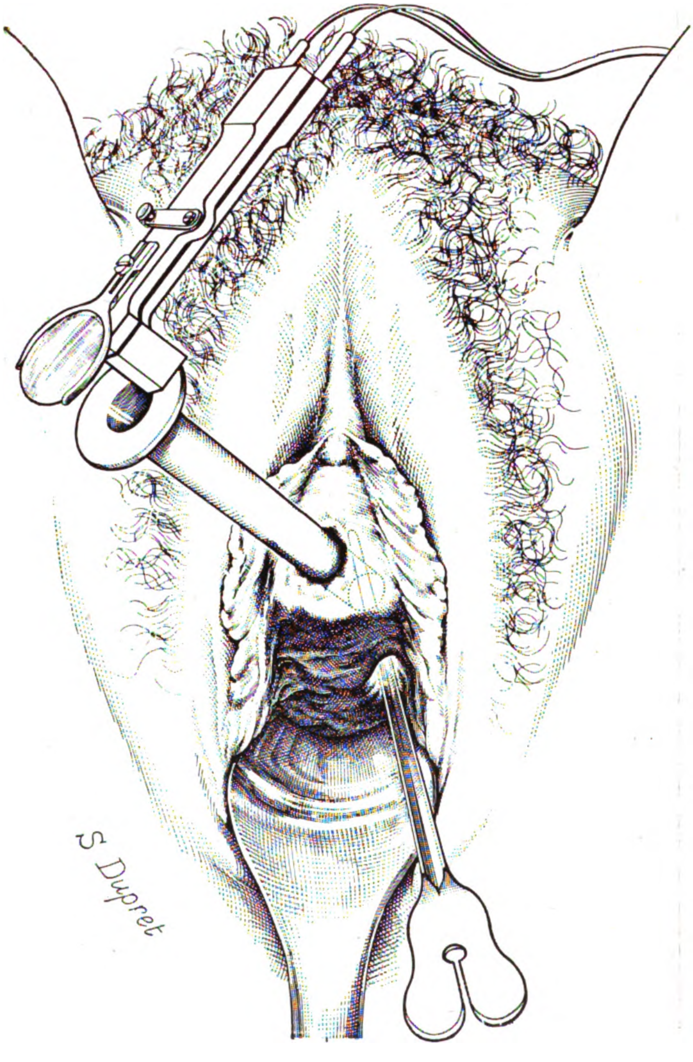

Fig. 158.—Determining the exact position of the orifice of a vesicovaginal fistula by means of direct vision cystoscopy. A grooved director inserted into the fistula marks the orifice of the fistula in the bladder.

Verneuil has called attention to this subject,[3] and has reported several cases of fistula joining the neck of the bladder with the urethra; he termed them "urethrovesicovaginal fistulæ." He distinguished several groups:

1. Very long fistulæ, affecting the neck of the bladder and of the urethra considerably, and showing one large opening bordered by the bladder and the remnant of the urethra.

2. Fistulæ situated low down, with a modification of the urethral path or caliber:[4] Verneuil thought that many cases reported as obliteration of the canal, are rather deviations, and that obliteration is very rare. He cites two cases.

3. Fistulæ situated low down, in which a continuous incontinence simulated a complete destruction of the urethra and its sphincter: Tavernier and Stephani have observed also a vesicovaginal fistula which involved the neck of the bladder and the urethra; they succeeded in bringing about a perfect cure, with complete continence.[5]

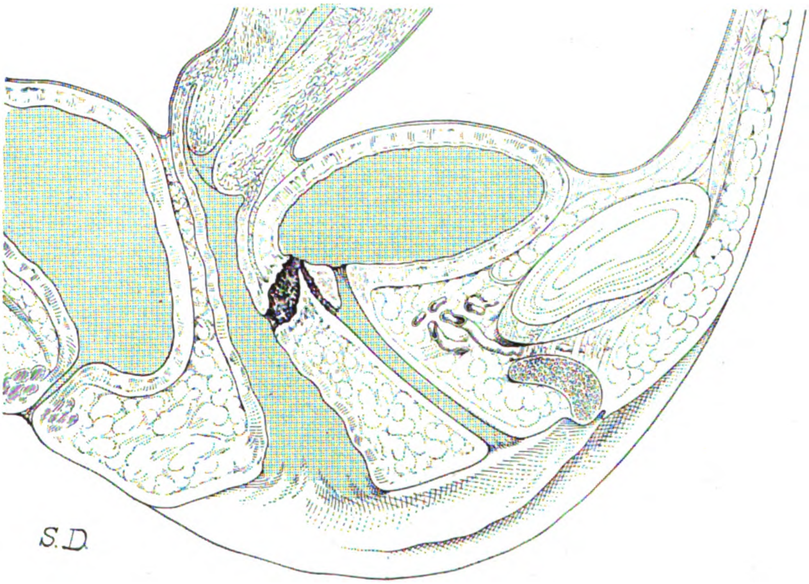

Fig. 159.—Diagram showing the arrangement of the ureterovesicovaginal fistula.

A monograph has recently appeared on this subject, by Piontik, of Pesia (*Ueber Blasen-Cervixfisteln,* Charlottenburg, 1909). The case which is the basis of this report, is the following:

Mme. W. L., aged twenty-nine, was sent on February 3, 1911, to the Broca Hospital, in the service of Pozzi, complaining of constant enuresis. Six months previously she had been delivered of a child with forceps, at the Maternité; half an hour later, incontinence set in; the condition was unchanged whether she was lying in bed or up and about.

She went first to the Beaujon Hospital, where she was operated upon on October 12, 1910, but without any improvement whatever. On entering Broca Hospital, she presented a marked erythema on the inner surface of the thighs, due to the constant involuntary flow of urine.

On examination it was found that the vesical capacity was about 200 c.c. Above

PLATE XV

Fig. 1.—*Vesical leucoplakia.* This condition, observed during the course of a very marked cystitis, is characterized by the pale plaques of cystitis which contrast with the strikingly inflammatory red of the rest of the bladder.

Fig. 2.—*Chronic cystitis.* Mosaic aspect.

Fig. 1.

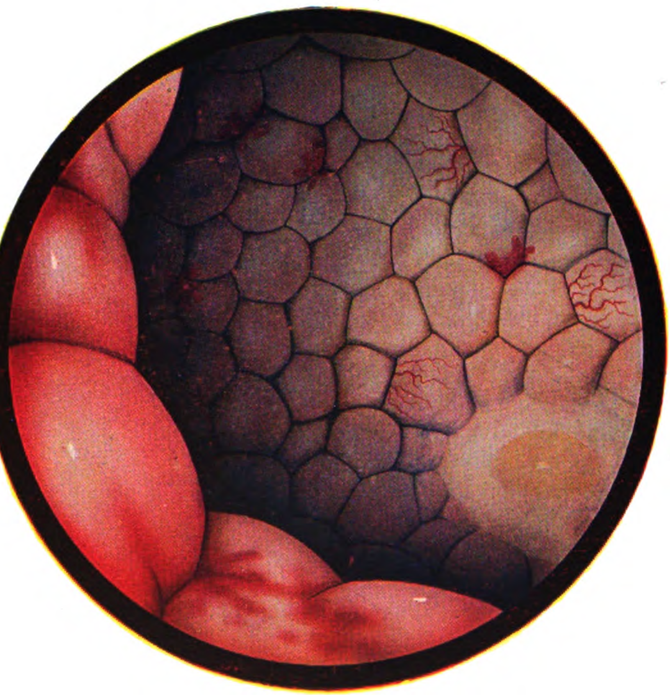

Fig. 2.

PLATE XV

this quantity the injected fluid escaped by the vagina. Urethral endoscopy showed that the canal neck was distorted. A tube of my direct vision cystoscope was obstructed at the bladder neck and could not penetrate further. It was impossible to introduce the instrument into the bladder unless the extremity of the instrument was turned obliquely and directed under control of the eye. The endoscopic examination showed that on the right side of the bladder neck and external to it, there was a distinct orifice with edematous edges. A ureteral catheter No. 6, was introduced into this orifice; it passed the right lateral portion of the vesical neck, rounded it and entered the bladder after a passage of from two or three centimeters (Plate XIII, Fig. 6). This was therefore a real urethral fistula. Examination of the ureteral orifices revealed that they were normal, normally located and could be easily catheterized.

In Sims' position with the speculum, a vesicovaginal fistula about the size of a franc [25 cent piece] was seen at the neck of the bladder and almost touching it. This fistula took on the appearance of a cleft, the anterior edge of the orifice overlapping the posterior.

To sum up then, there existed in the vesicovaginal partition a fistulous passage, bifurcated from a single orifice: One passage, a large one, extended from the bladder to the vagina; a second passage, smaller, passed from the bladder to the urethra, and extended around and outside of the bladder neck (see Fig. 159). The incontinence seemed to be due to the first of these passages, and was made the object of surgical intervention. The radical cure of the vesicovaginal fistula was effected by operation, on March 4, 1911, by Pozzi.

The edges of the fistula were transfixed by retention sutures of silver wire, the fistula well exposed and the edges excised. Excision was difficult because of the proximity of the neck of the bladder. To avoid traction on the upper edge, a large transverse incision was made in front of the neck of the uterus, which allowed the union of the edge to the fistula and thus gave a large raw surface. The fistula was first obliterated with chromic gut. The closure of the fistula was then completed by some deep silver sutures which passed into the uterine neck. Finally, perfect apposition of the wound was secured by superficial silver sutures. A permanent catheter was passed into the bladder.

The postoperative history was without incident. On March 17 the sutures were removed; on March 24 the catheter was withdrawn and patient sat up. The operative result was perfect, for she regained complete urinary control, whether reclining or up and about.

On March 31, 1911, endoscopy showed that the above described anatomic conditions at the bladder neck remained unchanged. The same orifice on the right side of the bladder neck still permitted the introduction of a ureteral catheter which passed easily into the bladder. But this did not at all interfere with the bladder function, the bladder remaining quite water-tight, and urination being performed under normal conditions which required no further therapeutic interference. The patient left the hospital, and when seen seven months later (October, 1911) she was in excellent condition.

7. **Possibility of Examination with Pregnancy or Abdominal Tumors.**—It is a well-established fact that to obtain a distinct view with the indirect vision cystoscope, it is necessary to keep the instrument at a certain distance from the object to be examined. Now, when the bladder is compressed through pregnancy or because of a tumor near the bladder, this mass makes it impossible to maintain the cystoscopic prism at a sufficient distance from the vesical mucosa. This disadvantage does not exist in direct vision cystoscopy, because the instrument can be brought to the very wall of the bladder, and allows the smallest detail to be studied. Examination of the bladder in pregnancy with

the direct vision cystoscope, has been studied in collaboration with Bar; a report of this work is published further on (see page 248).

8. **Extraction of Foreign Bodies.**—Extraction of foreign bodies is extremely easy with the direct vision cystoscope; this subject will also be thoroughly discussed later on.

9. **Treatment of Cystitis.**—The treatment of cystitis with the direct vision cystoscope gives results that are absolutely remarkable, and will be discussed at greater length.

10. **Treatment of Bladder Tumors.**—The treatment of bladder tumors with the direct vision cystoscope produces radical cures. This subject will likewise be discussed in subsequent pages.

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[1]Luys: Rev. de gynéc. et de chir. abd., March, 1912, No. 3.
[2]Luys: Exploration de l'appareil urinaire, Paris, Masson, 1909, ed. 2, p. 217.
[3]Verneuil: Chirurgie réparatrice, p. 932.
[4]Verneuil: Bull. et mém. Soc. de chir. de Paris, 1875, p. 322.
[5]Tavernier and Stephani: Lyon méd., Dec., 1909, p. 1023.

OBJECTIONS TO DIRECT VISION CYSTOSCOPY

1. **Diminution in the Visual Field.**—It is undeniably true that the visual field is much more restricted in direct vision cystoscopy than in the indirect system. However, this reduction is more apparent than real. It is quite true that when the extremity of the cystoscope is applied directly to a point of the vesical mucosa, the observer's eye can not pass much beyond its limits. On the other hand, it is equally true that when the cystoscopic tube is kept at a certain distance from the surface to be examined, the visual field becomes much more extensive. In fact, the ease and rapidity with which the cystoscopic tube can be manipulated in the interior of the bladder, make possible a thorough examination of the entire surface of the mucosa. Tuffier has well said in this connection, "What one sees, one sees very clearly."[1]

2. **Caliber of the Instruments.**—The instruments employed in direct vision cystoscopy are necessarily larger in caliber than those used in the indirect method. The size of the instruments used in the female is of little moment, owing to the ease with which the female urethra can be dilated; in the male, however, the question of size of the instrument is of considerable importance. It may be well to remember however, in this connection, that the difference in caliber between the cystoscope for ureteral catheterization (25 Charrière) and my male cystoscope (27.5 Charrière) though appreciable, is nevertheless not very considerable.

3. **Unfolding of the Vesical Wall.**—As has already been stated, the unfolding of the vesical wall through the inclined position sometimes fails, in the obese, particularly the male, thus making the bladder examination difficult and sometimes even impossible.

This faulty retraction of the abdominal wall is usually due to abdominal plethora, which prevents the bladder from filling up with air, in the inclined position. However, there is a method of overcoming this disadvantage, at least up to a certain point. It consists, as already stated (see page 233, Fig. 156) in having an assistant seize the abdominal wall above the pubis, with both hands, thus forming a large transverse fold, and exerting an upward pull; in this manner, the complete unfolding of the vesical wall is often obtained, especially in very stout women.

The inclined position is likewise accepted very poorly at times by elderly patients, who are asthmatic or very stout. These conditions are evidently entirely unfavorable for direct vision cystoscopy and must be considered as a contraindication.

REFERENCE

[1]Tuffier: Bull. et mém. Soc. de chir. de Paris, March 7, 1905.

COMPARATIVE ROLE OF INDIRECT AND DIRECT VISION CYSTOSCOPY

Having studied the comparative advantages and disadvantages of direct and indirect vision cystoscopy, it is well now to examine in detail the indications of each method, and the conditions under which one or the other is to be preferred. Above all, however, it should be stated that prismatic cystoscopy should not be set up in opposition to direct vision cystoscopy. Both methods are useful and each has its respective indications, and it were childish to attempt to establish a rivalry between them.

When the condition of the bladder *ensemble* is to be determined so that a diagnosis may be made, it is undeniably wise to begin with the indirect cystoscope. This instrument gives an extensive visual field, and a complete examination of the bladder can be made with it in a short time; and when the patient happens to be large and stout, in whom the inclined position would be particularly uncomfortable, this instrument will be found preferable by far.

But on the other hand, when the presence of blood or pus in too great a quantity renders it impossible to obtain a sufficiently transparent medium even with the aid of the irrigating cystoscope, the di-

rect vision cystoscope should be resorted to, and it will reveal every portion of the bladder despite severe bleeding or intense pyuria. In addition, doubtful points will be cleared up and the real size of a tumor determined far better through the direct and immediate view than through the prism.

If a vesical tumor or a foreign body is examined with both instruments, the same impression can not be obtained with the indirect instrument as with the direct. It is a fact, that in order to see well with the indirect cystoscope it is necessary to keep at a certain distance from the object to be observed; many bearings must be taken in order to be able to examine all around the tumor, to determine the distance and the volume of the tumor by this method. On the other hand, with the direct vision cystoscope, the object is seen directly as it really is, and its exact size can be determined in the most precise manner.

Moreover, in numerous instances, the indirect cystoscope leaves the observer in doubt as to the existence of a calculus in the bladder. Indeed, in chronic cystitis, the vesical wall may be altered to such an extent, that large masses of pus may accumulate in the fundus and simulate a stone perfectly. This error can never occur with the direct vision cystoscope, for it is an easy matter to introduce a metallic stylet into the cystoscopic tube and thus obtain the metallic contact which makes certain the diagnosis of vesical calculus. This maneuver is not possible with prismatic cystoscopy. [With the most modern operative cystoscopes (indirect), it is just as simple a matter to introduce a stylet up to the suspected stone, to obtain the metallic contact. This contact may often be obtained by the cystoscope itself coming in contact with the mass and eliciting the sensation the author refers to.—EDITOR.]

Similarly, in studying certain inflammatory changes of the vesical wall, encountered in mild cystitis, much more numerous and clearer details can be seen with the direct instrument than with the indirect, because the tube of the direct cystoscope comes into direct contact with the wall itself, and thus brings the smallest details into view. Moreover, by placing the tube in profile, a perfect view of the minutest elevations and of the slightest inflammations of the vesical wall can be obtained; these details are important and should never be neglected, for it is due to them and to the knowledge of their presence that exact indications for treatment can be secured.

Still further, when both sides of the bladder neck are to be examined, only the direct cystoscope should be employed. Indeed, while the indirect can furnish a detailed view of the vesical aspect of the bladder neck, it is absolutely incapable of furnishing any information

concerning the urethral side. On the other hand, the direct vision cystoscope will give a perfect view of both aspects. With the cystoscopic tube still inside of the bladder, its vesical extremity directed downward, the entire inferior wall of the bladder neck can be fully examined; directing the end of the tube upward, while the hand of an assistant makes downward pressure on the abdominal wall above the pubis, the entire part of the bladder neck is thoroughly examined. The examination having been completed, on the bladder side, the cystoscope is then slowly withdrawn and the bottom of the tube is seen empty at first, but gradually enshrouded as it were, from periphery to center, with the prostatic portion of the urethra (Plate X, Fig. 1). The urethra may now be minutely examined, since under these circumstances, the cystoscope has practically become a urethroscope.

Again, in the matter of local intervention, within the bladder, the direct vision instrument is to be preferred. Whether it be for the purpose of removing foreign bodies, cauterizing vesical tumors, or applying local treatment to plaques of cystitis, it is best to have recourse to the direct vision cystoscope.

And as for catheterization of the ureters, we shall not insist at the present moment, for we shall discuss the indications with one method or the other in a special chapter later on. Nevertheless we may maintain in advance the superiority of the direct instrument which permits catheterization of the ureter directly, while minimizing the chances of contaminating a healthy kidney. The ureteral catheter passing directly from the sterilizer into the ureteral orifice, can not take up any infectious germs en route and thus contaminate the healthy kidney and ureter.

Finally, as we shall now see, the direct view cystoscope enjoys a well-marked superiority in the examination of the bladder during pregnancy.

Note: The editor has requested Dr. William F. Braasch, who is one of the foremost American advocates of direct cystoscopy, to state briefly the American viewpoint on this subject. His contribution follows:

DIRECT CYSTOSCOPY

By W. F. Braasch, M.D.

"The direct cystoscope has been variously employed in the cystoscopic past. Foremost among the list of adherents to the direct method we find the name of Howard Kelly.[1] His well-known methods need no further description, and today they are still widely employed. His

method has not, however, received universal acceptance for several reasons; namely, (1) the preponderance of lens sentiment; (2) the awkward position and exposure of the patient, particularly if anesthetic be given; (3) the inability to employ the method in the male. The credit for presenting the first direct cystoscope of the modern type should be given to Bransford Lewis.[2] His instrument permitted the dorsal position use in the male and included catheterizing tubes. Instead of relying on atmospheric pressure to distend the bladder, as in the Kelly method, he employed an air pump with a retaining window. Direct air cystoscopes, similar to that of Bransford Lewis, appeared in rapid succession, Koch, Belfield, Snell, Elsner,[3] Luys,[4] etc. These instruments did not receive widespread employment largely because of the awkwardness and pain caused by air distention so employed, and by the general recognition that water was the better bladder medium in cystoscopy. The employment of water in this type of air cystoscope is responsible for its survival. The late M. C. Millet of the Mayo Clinic, was the first to demonstrate the value of this method. He was among the first to employ the direct view air cystoscope, and after finding the use of air so often unsatisfactory, substituted water for air. The use of water in the direct cystoscope embodied an entirely new principle. At first thought the idea of looking through a tube of water hardly seems practical. The water medium magnifies the field slightly and brings it out in clear relief, but does not distort the object observed. Furthermore, it is less painful than air in the bladder and is more easily controlled. Having briefly outlined the origin of the method we are employing, I will discuss the comparative advantages of the lens instruments now used and the direct view water cystoscope.

"The lens instrument offers the following advantages: 1. It gives a field of greater circumference. 2. It permits a clearer view of the anterior wall of the bladder in the male. 3. It offers a more detailed and magnified view of the bladder mucosa.

"While it is true that the field of vision in an observation lens is greater than through a direct cystoscope, nevertheless with many catheterizing lenses the actual diameter of the field is not very much larger. Moreover, what one loses in circumference of the field is at least partially made up by the increase in perspective gained by direct inspection. Although the anterior bladder wall is easily viewed through an observation lens, still in the female it can be inspected quite as easily through the direct cystoscope. By partially emptying the bladder and by permitting the roof to sag down, but little escapes inspection in the male bladder. With greatly hypertrophied prostates

it may occasionally become difficult to inspect the anterior bladder wall. While the detailed and magnified view of the bladder mucosa and ureteral meati obtained through a lens may occasionally be of some advantage, nevertheless the picture obtained by the unaided eye is a truer one and loses no data of practical value.

"The advantages of the direct view are: 1. Its simpler mechanism. 2. A clearer view of the field in case of hemorrhage. 3. The field is natural, requiring no interpretation. 4. Use as urethroscope as well.

"The simpler mechanism of the direct cystoscope offers the following advantages: (a) It is less often damaged and in need of repair than the fine lens adjustments; (b) it is more easily sterilized by momentary immersion in pure phenol followed by washing in water; (c) its use does not require careful preliminary irrigation of the bladder. With a freely bleeding bladder mucosa it is frequently impossible to obtain a clear view through a lens cystoscope in spite of continuous irrigation. With the direct instrument, on the other hand, we are looking through a clear stream of water which is continuously entering the bladder and washing the observed area, and bleeding is seldom so great as to render examination impossible. Most beginners in the use of the lens cystoscope complain of the difficulty in interpreting the field observed. Although the inversion of the object is now corrected by the latest lenses and the interpretation is somewhat simplified, nevertheless the magnification in the frequently blurred field is confusing to the novice. On the other hand, the direct natural view is readily and accurately interpreted in a comparatively short time.

"The direct cystoscope may also be employed as a urethroscope. While the view thus obtained may lack the magnified detail afforded by the lens instruments, the actual value of which is questionable, everything of practical importance is clearly visible. Although the importance of routine urethral examination has undoubtedly been recently exaggerated, an instrument which will permit urethroscopic as well as cystoscopic examination is frequently of considerable value. Of particular interest is the direct inspection of the prostate from the viewpoint of the prostatic urethra from which the relative size, position, and frequently character of the enlargement is readily ascertained."

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[2]Lewis: Jour. Cutan. and Genito-Urinary Dis., 1900, p. 420.
[3]Elsner: Pilcher's Practical Cystoscopy, pp. 82, 83.
[4]Luys: Assn. franç. d'Urol. Proc.-verb, 1905, Par., 1906, pp. 467-482.

DIRECT VIEW CYSTOSCOPY DURING PREGNANCY

Cystoscopic conditions in general are particularly unfavorable in the pregnant woman, whose bladder is deformed and often displaced. Indeed, owing to traction exerted by the inferior segment and compression exercised by the fetal head, the vesical cavity is considerably contracted in certain parts, especially at the fundus. This arrangement does not permit the movement of the cystoscopic prism to a distance sufficient to give a clear view of the fundus. Moreover, it is difficult to maneuver the elbow of the indirect cystoscope in the limited space thus reserved for the evolution of the instrument.

On the other hand, these difficulties are not met with in direct vision cystoscopy; because of its straight shape, it is easy of evolution and permits direct examination of the different parts of the bladder, as

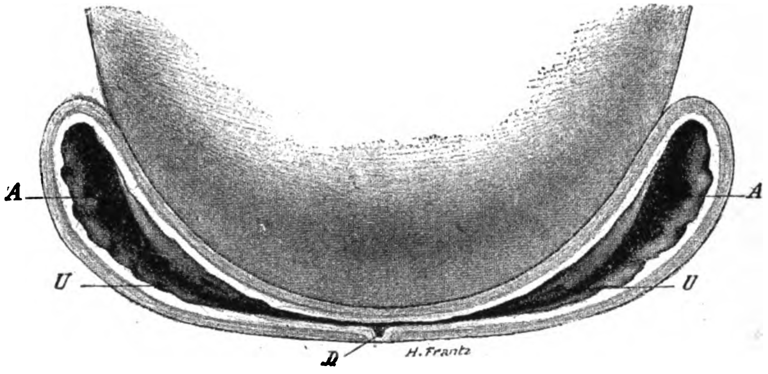

Fig. 160.—Diagrammatic section showing the aspect of the bladder in pregnancy.

well as a clear view of the smallest lesions, with their exact size and situation.

Bar and I undertook a series of investigations with my direct vision cystoscope regarding the condition of the bladder in pregnancy,[1] and among the facts brought out, these two are especially to be kept in mind: 1. The deformities of the bladder at the height of pregnancy. 2. The displacement of the vesical orifices of the ureters in certain females.

1. **Deformity of the Bladder at the Height of Pregnancy.**—For a long time obstetricians have called attention to the deformities and displacements of the bladder at the height of pregnancy. These deformities are the result of overdistention of the lower segment of the uterus, and particularly of the engaging of the fetal head. The bladder being forced backward, permits itself to become distended wherever possible, and thus becomes deformed.

The deviations of the bladder are often more apparent than real. The unequal distention of the various regions of the organ may give the impression of a deviation which does not really exist, at least, as judged by the vesical trigone, which always remains in the median line. We can readily understand that this must be so, if we consider the fact that at the height of pregnancy the uterovesical cellular tissue is extremely lax. This laxity gives to the bladder a remarkable freedom of motion, as compared with the uterus. We must also take into consideration the fact that the urethra on the one hand, and the two ure-

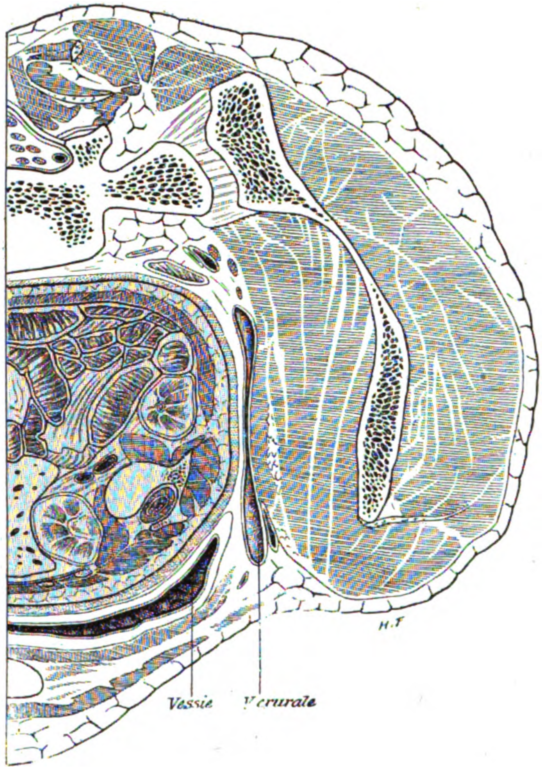

Fig. 161.—Frozen section of a pregnant female (after Zweifel).[2] The lateral portion of the bladder can be seen, much larger than the median portion.

ters on the other, constitute real ligaments for the trigone, which contribute toward maintaining it in its normal position.

Nevertheless, real deviations of the bladder may exist. The vesical trigone may not be median, in the sense that the two ureteral orifices are not equidistant from the sagittal plane. These deviations are due to the fact that the cellular tissue between the bladder and the inferior segment, however flabby the latter may be, occasionally constitutes but a feeble union between the two organs, especially when

the lower segment is overdistended as is the case at the height of pregnancy. The trigone can be actually deviated when the uterus and its lower segment execute a rotary movement toward the end of pregnancy, so as to bring the left edge of the organ forward. This rotary movement is generally encountered when the lower segment distends itself more on one side than on the other; this condition is often observed in cervical presentation and also frequently in presentation by the breech.

It goes without saying, of course, that when these deviations occur, they will reach their maximum at labor. But they may also be observed during the last periods of pregnancy before the onset of true labor, when the painless contractions of the uterus announce the im-

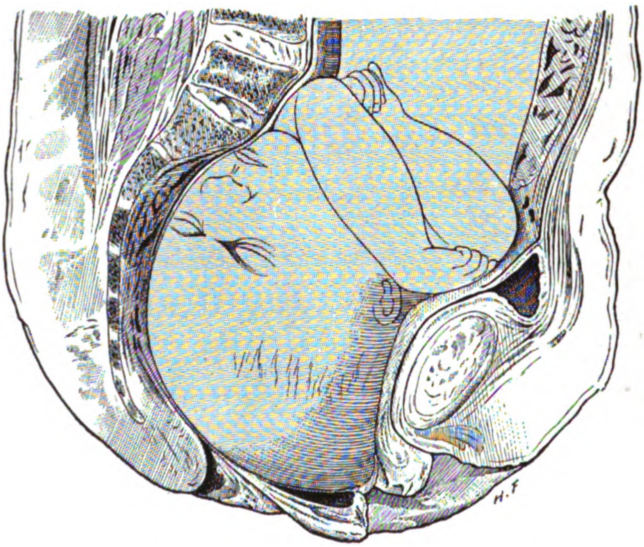

Fig. 162.—Aspect of the bladder in a frozen section of a pregnant female (Barbour).[3] Here too the lateral enlargement of the bladder can be seen.

pending delivery and already modify the form and the position of the uterus.

Of the various deformities of the bladder which the cystoscope has enabled us to observe in the living subject, we shall now consider only the most common and the most important of all; namely, that which is observed during the final period of pregnancy when the fetal head is fully engaged. We are at once struck with one thing. In the median line, the anterior and posterior walls of the bladder are closely applied one against the other. The organ seems to be pushed downward and flattened by the inferior segment. Above this median zone which often leaves little space for the urine, an upper diverticulum

of considerable size is seen; this forms the vast pocket which is outlined above the pubis in so many pregnant women.

This pocket extends laterally to such a degree that the bladder being emptied, two diverticula can be seen at the sides, unequal and quite deep. These diverticula are best observed in the Trendelenburg position. Frequently they are found filled with urine. In order to understand this description better, the reader will refer to Fig. 160, where the picture of the bladder is quite characteristic. Let a transverse section be assumed passing immediately in front of the neck of the bladder and of the point of entrance of the ureters in the bladder. Imagine a sac having two walls, covering the inferior segment; on the median line the two walls touch each other; above, are the orifices of the ureters, U,U; below, the orifice of the urethra, D, and on the lateral walls, two diverticula, A,A, which are the last to empty themselves. In these diverticula a catheter or a cystoscope (since we are discussing cystoscopy) must be introduced to obtain the required dry medium, at least in the Trendelenburg position.

We have been able to demonstrate that this arrangement is the usual one when the fetal head is fully engaged, and we have every reason to believe that we have not been deceived by appearances. Consulting the color plates at our disposal, which represent frozen sections, we have found an arrangement of the bladder quite analogous to that which we are describing; and in a plate published by Zweifel (Fig. 161), representing a transverse section (passing through the promontory and the upper part of the pubis) of a woman who died in labor, the same arrangement is shown. Barbour has also represented the bladder with a similar arrangement in a frozen subject (Fig. 162).

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[1]Paul Bar and Georges Luys: Examen de la vessie chez la femme enceinte, par le cystoscope à vision directe (Societé d'Obstétrique de Paris, Session of March, 1906).

[2]Zweifel: Zwei neue Gefrierschnitte Gebarende, Leipzig, 1893; Plates 1 and 6, representing a transverse section. The bladder is flattened medially; on the left side, the only side represented, the organ is prolonged distinctly outward and is much less flattened than in the median line.

[3]Barbour: Atlas of the Anatomy of Labour, Plate XXII, Edinburgh, Johnston, 1897.

2. **Relation of the Neck of the Bladder to the Ureteral Orifices.**—It is interesting to determine the relative position of the bladder neck and the ureteral orifices. In the Trendelenburg position the vesical trigone is horizontal; and when the cystoscope is inserted straight ahead into the bladder and up to the fundus, then withdrawn slightly toward the bladder neck, we can see the projection made by the transverse muscle

fibers (interureteral ligament) which unite both ureteral orifices. The latter situated deeply and laterally, are on the same plane as the neck of the bladder. But a quite different arrangement is noted at full term, especially in the primipara, when the head of the fetus has fully engaged.

In the nonpregnant woman, in the erect position, with the bladder empty, the anteverted uterus impresses a slight transverse fold on the vesical trigone, which is effaced in the Trendelenburg position, because of the traction exercised by the uterus on the upper part of the trigone.

In the pregnant woman, especially in the primipara, this fold of

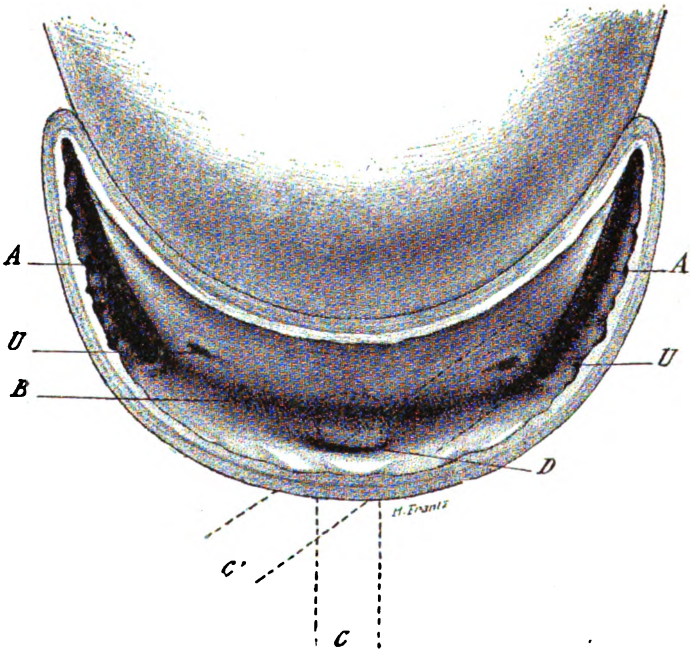

Fig. 163.—View of the bladder and ureteral orifices in the pregnant female. *U,U*, opening of the ureters into the bladder; *D*, urethral canal opening into the bladder; *B*, transverse plicature of the trigone; *A,A*, lateral prolongations of the bladder; *C*, direction of the cystoscope as it enters the bladder; *C'*, direction of the instrument pointed toward the ureter.

the trigone is often much more marked than in the nonpregnant, and it can be readily understood why it must be so. Because the expansion of the inferior segment is accomplished almost entirely at the expense of the anterior wall, the neck of the bladder is pushed backward where it is held firmly by the uterosacral ligament and their intrauterine extension. To a certain extent, when the bladder is empty or nearly so, the vesical trigone responds to the pull which the lower segment exerts on it through the action of the vesicouterine cellular tissue. The trigone, thus retracted backward, but held tightly upward

and forward by the ureters and downward and forward by the urethra, becomes folded on itself. With the woman in the Trendelenburg position, this plicature is maintained because of the slight displacement of the uterus. This arrangement we repeat, is especially marked in the primipara, when the presenting part is firmly engaged and when the bladder neck is strongly turned backward; the above arrangement may be lacking in multiparæ.

The appearance of the bladder when the fetal head is firmly engaged, is well shown in Fig. 163. In this position the ureters do not enter the bladder on the same level as the urethra, but more or less higher up.

3. **Pathologic Vesical Deformities and their Relation to Ureteral Catheterization.**—The deformities which we have just discussed are not without interest from the pathologic point of view, and they should not be forgotten when the ureters have to be catheterized with the patient at full term.

It is well to remember above all, that the lateral diverticula in the bladder empty themselves poorly; these partial retentions are therefore of interest in connection with the tenacity of vesical infections during pregnancy. In one instance, I have been able to note that the lesions of the vesical wall and the purulent deposits simulating false membranes, were found particularly in the right side of the bladder, external to the vesical entrance of the right ureter, where the bladder presented a sort of lateral diverticulum which emptied itself badly.

We may presume that the pressure exerted by the inferior segment upon the upper part of the trigone, and the terminal portion of the ureters, favors the retention of the urine; that is perhaps not insignificant from the point of view of the frequency with which the intraureteral retention of urine during pregnancy, is observed.

On the other hand, from the standpoint of ureteral catheterization, the discovery of the ureteral orifices will be particularly facilitated, if we bear in mind the fact that these orifices should be sought, when the head is engaged, not below and outward, as in the nonpregnant subject, but further forward, above the transverse depression which projects above the bladder neck.

In brief, the following rule may be laid down: In pregnancy, when the ureteral orifices are not found immediately, by the method of Luys which has just been described, they must be looked for higher up and further forward; they will then be easily found.

CHAPTER VII

CATHETERIZATION OF THE URETERS

Ureteral catheterization constitutes one of the most important and interesting applications of cystoscopy. The introduction of a catheter into the ureter, not only makes possible the complete exploration of this canal throughout its length and also of its corresponding renal pelvis, but it has numerous other applications besides; to these we shall return later on. The most important are the following:

1. The study of stricture or obliteration of the ureter and of the therapeutic measures applicable to these lesions.
2. The search for calculi in the ureter.
3. The treatment of renal colic.
4. The exploration of the kidney pelvis either for a calculus, or as a general diagnostic measure, or to determine the capacity of the pelvis.
5. As a therapeutic measure, to irrigate the renal pelvis in certain forms of mild pyelitis.
6. As a therapeutic measure to assure the proper caliber of the ureter after ureterolithotomy.
7. As a prophylactic measure to safeguard the ureters during gynecologic operations, such as for cancer, fibroma of the uterus, etc.
8. For drainage and rapid closure of certain fistulæ after nephrotomy.
9. For the treatment of certain hydronephroses.

How large a field is offered by ureteral catheterization is clearly evident, and we shall begin by studying the most practical methods of catheterization. We have two methods at our disposal,—with the indirect (prismatic) cystoscope and with the direct vision cystoscope.

URETERAL CATHETERIZATION WITH INDIRECT VISION CYSTOSCOPY

Of all the indirect vision cystoscopes which have been especially devised for ureteral catheterization, we distinguish two principal types; these have been studied carefully in the interesting monograph of Imbert:

1. **Instruments in Which the Catheter Is Not Deflected.**—

Brenner's Cystoscope.—Brenner seems to have been the first to

introduce a flexible catheter into the female ureter, in 1887. His instrument was a modification of Nitze's cystoscope No. 2, and adapted to his special purpose.[2] It consisted of a prismatic (indirect) cystoscope with the visual field and lamp situated on the convexity of the beak. Inferiorly and running through the entire length of the cystoscope was a little channel for the ureteral catheter. The inventor succeeded quite easily in catheterizing the female ureter, but in the male all his efforts failed completely.

Boisseau du Rocher's Megaloscope for ureteral catheterization presented the same arrangement and consequently offered the same disadvantages. The great difficulty in catheterizing the ureter with these instruments lay in the fact that the catheter could not be deflected and that it had to pass in a straight line from the urethra to the ureter. It was therefore necessary to tilt the handle of the cystoscope very obliquely, and this was done only with great difficulty.

2. **Instruments in Which the Catheter Can Be Deflected.**—With the object of remedying the principal faults just mentioned, the following instruments were devised and constructed:

Tilden Brown's Cystoscope.—Brown utilized Brenner's instrument. He modified it by constructing a fine stylet that could be inserted into the interior of the ureteral catheter. This stylet had an elbowed vesical extremity, so that it could be extended about three centimeters beyond the tip of the cystoscope. The cystoscope is introduced into the bladder, the catheter canal being closed with an obturator. The latter is then removed and replaced by the catheter and its stylet. The ureteral orifice is then sought, and when found, the tip of the stylet is directed upon it. By means of the stylet the extremity of the catheter can be given any position, and it thus becomes an easy matter to direct it toward the ureter. The author succeeded in catheterizing the male ureter with this instrument.[3]

Nitze's Cystoscope (First Model of 1896).—In his first experiments with ureteral catheterization, Nitze surrounded his simple cystoscope with an oval metallic sheath in which the ureteral catheter was to pass. This sheath extended beyond both ends of the cystoscope, so as to permit the easy introduction of the catheter on the one hand, and also to give it the necessary flexibility, on the other. The metallic sheath was movable forward and backward, and from side to side, so that the tip of the catheter could be deflected in all directions and thus brought to the orifice of the ureter.

This primitive instrument had the great disadvantage of being too bulky, and its introduction was, therefore, difficult. It was con-

sequently soon abandoned by its inventor, who adopted later improvements and developed another model, which is still very widely used at the present day (Fig. 164).

CASPER'S CYSTOSCOPE.—This instrument (Fig. 165) apart from the cystoscope proper, comprises a catheter canal situated superiorly. This

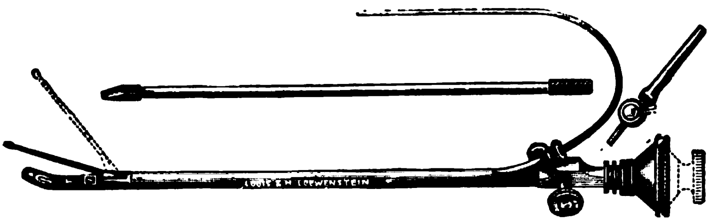

Fig. 164.—Nitze's cystoscope for ureteral catheterization; improved model.

canal is covered by a deflector which serves to control the bending of the catheter; so that the further the deflector is introduced, the more will the catheter be bent, and the more it is withdrawn, the less will the catheter be deflected from the straight line.

This instrument, which can be introduced more easily than Nitze's

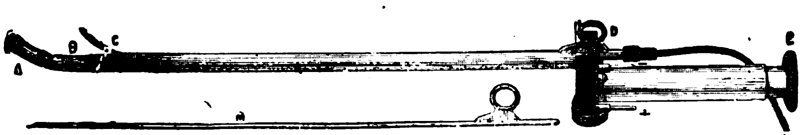

Fig. 165.—Casper's ureteral cystoscope. *A*, electric lamp; *B*, prism; *C*, inferior orifice of a channel (gutter) which runs along the entire length of the instrument, and which is transformed into a closed canal by the sliding rod *D*, represented separately as *M*. The ureteral catheter traverses this canal; *E*, ocular.

early model, does not, however, permit the easy introduction of a ureteral catheter. Casper, therefore, devised a more recent model (Fig. 166) in which the groove for the ureteral catheter is divided into two parts which makes possible the catheterization of both ureters without withdrawing the cystoscope from the bladder. This constitutes a very important improvement.

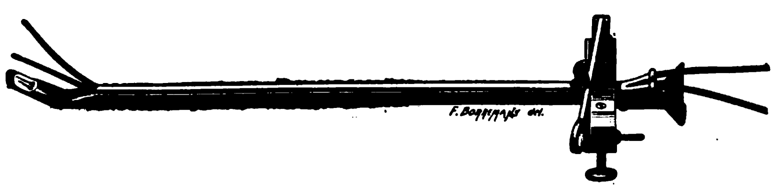

Fig. 166.—Casper's double ureteral cystoscope.

ALBARRAN'S CYSTOSCOPE.—Practical catheterization of the ureter was made possible by Albarran, who described it in 1897 (Fig. 167). His cystoscope[4] is composed of several distinct parts: 1. The optical

portion, the general arrangement of which is that of an ordinary cystoscope. The two ureteral or irrigating portions may be mounted upon this part, as desired. 2. The ureteral portion consists of an open groove, which is properly adjusted to the optical portion. Along the sides of this groove are two thin stems of steel which are connected

Fig. 167.—Albarran's simple cystoscope.

with a deflector at the optical part of the cystoscope. This deflector articulates with a groove, and can assume any position, between the horizontal and an angle of 130 degrees. When the deflector is in the last position, it is perfectly adjusted to the terminal part of the groove; this is the position of the instrument when not in use. The move-

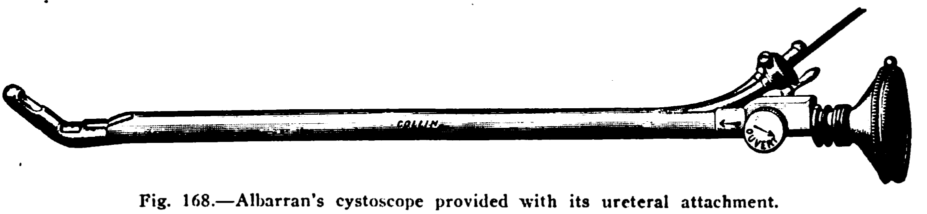

Fig. 168.—Albarran's cystoscope provided with its ureteral attachment.

ments of the deflector are controlled by a wheel, which is placed near the ocular extremity of the instrument and raises or lowers the deflector. The vault of the groove is traversed by a canal for the ureteral catheter; the catheter emerges in front of the deflector and lies directly upon it when it is inserted. By maneuvering the wheel, this

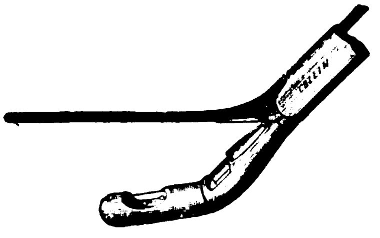

Fig. 169.—Albarran's deflector, which moves the catheter and thus permits ureteral catheterization.

arrangement permits the tip of the catheter to take any position between the horizontal and an angle of 140 degrees. Thus the angle of the catheter may be changed at will. The ureteral channel presents externally a little box which bears a small round rubber shield or cap, pierced for the passage of the catheter. By tightening the screw to

PLATE XVI

FIG. 1.—*Typical aspect of a tuberculous ureteral orifice,* indicating an accompanying tuberculous pyonephrosis. A few ulcerations resembling nail scratches are seen outside of the ureteral orifice.

FIG. 2.—*Tuberculous ulcerations of the bladder* seen with the direct vision cystoscope.

FIG. 3.—*Tuberculous ulcerations of the bladder* treated with applications of the silver stick, through the direct vision cystoscope. The ulcerations represented in this figure, are the same as those in Fig. 2, but the central ulcerations have been touched with the stick. The impressions of the silver pencil are easily recognized.

Fig. 1.

Fig. 2.

Fig. 3.

PLATE XVI

a greater or less degree, the rubber shield is flattened and the vesical fluid is prevented from escaping, while the catheter is enabled to move freely to and fro.

Above the ureteral channel, there is another canal, provided with a little stopcock; this channel is used for cleansing the lenses or irrigating the bladder. This cystoscope and its attachment has a caliber of No. 25 Charrière.

3. The irrigating portion is also closely fitted by a groove to the optical apparatus. In the anterior convexity of this groove is found an irrigating canal which opens near the lens and has a stopcock at its outer extremity. All of this constitutes an irrigating cystoscope which permits irrigation of the bladder and cleansing of the lenses. The deflector renders catheterization simple and practical, and has been adopted universally by cystoscope makers.

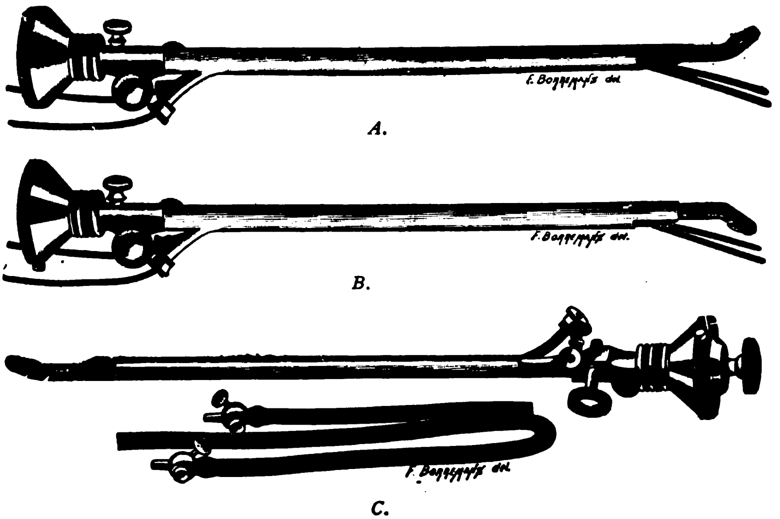

Fig. 170.—Bierhoff's modification of Albarran's cystoscope, permitting the simultaneous catheterization of both ureters.

Israel's Cystoscope.—This instrument differs from Nitze's by having a double ureteral canalization, thus permitting the simultaneous catheterization of both ureters, and also by having a movable irrigating attachment.

Bierhoff's Cystoscope.—This is an Albarran cystoscope, modified so as to effect the simultaneous catheterization of both ureters (Fig. 170). In this instrument, the optical portion to which the lamp is fixed is movable; it also avoids the disadvantage of the two ureters crossing each other when the cystoscope is withdrawn and the catheters left *in situ* in their respective ureters.

Wossidlo's Cystoscope.—This is also a double catheterizing instrument. In this cystoscope the lens and the lamp are situated on its convexity, so that it is a simple matter to withdraw the instrument and leave the ureteral catheters *in situ,* without turning the cystoscope. Its caliber is 23 Charrière, and the ureteral channels will accept No. 5 or 6 catheters, or even a single catheter of No. 7 caliber.

Frank's Cystoscope.—Frank, of Berlin, constructed a cystoscope

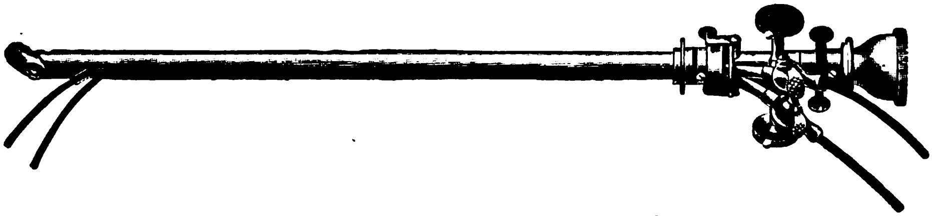

Fig. 171.—Freudenberg's cystoscope for catheterization of both ureters.

with a correct image for the catheterization of both ureters by the action of a double wheel which controls the deflector of each catheter separately.

Freudenberg's Cystoscope.—This author devised a combined cystoscope for catheterization of the ureters and bladder irrigation.[5] This

Fig. 172.—External tube of Freudenberg's cystoscope.

was first presented before the Urological Congress of Paris in 1904; various subsequent improvements were shown before the Congress of the International Surgical Society, held at Brussels, in September, 1905.

This cystoscope presents two new principles: In the first place, the

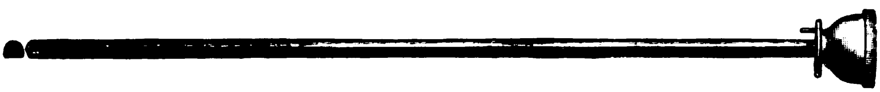

Fig. 173.—Optical portion (telescope) of Freudenberg's cystoscope.

lens, the lamp and the deflector are all on the convexity of the instrument; secondly, instead of a special channel for the ureteral catheter, there is a free space above the mounting of the optical portion in which the catheters move to and fro freely.

One or both ureteral catheters may be directed by a guide placed in this free space; this guide has a deflector at its vesical extremity

similar to that of Albarran. Finally, the optical portion is not circular, but flattened on one side, so that the visual field is made larger. Moreover, the entire optical apparatus including the ureteral guides can be removed separately without the necessity of withdrawing the entire instrument.

The advantages of this instrument are especially noteworthy in

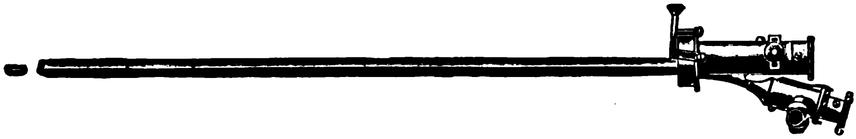

Fig. 174.—Irrigating tube of Freudenberg's cystoscope.

ureteral catheterization. Indeed after the ureteral catheters have been introduced, if it is desired to leave them in the ureters without the cystoscope, it is unnecessary to turn the instrument on its axis in order

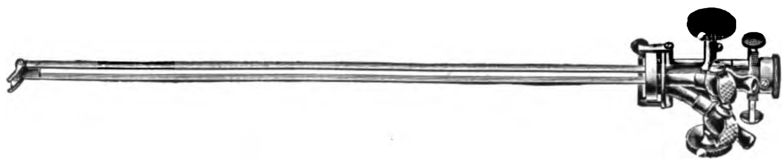

Fig. 175.—Ureteral catheter guides for Freudenberg's cystoscope.

to withdraw it. The optical portion having been removed, it is a simple matter to withdraw the cystoscopic tube by sliding it above the catheters without dragging them along. Another advantage is the possibility of using larger ureteral catheters than are possible with

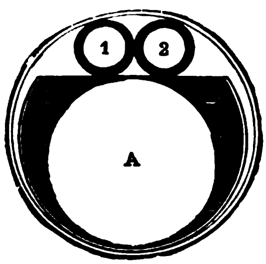

Fig. 176.—Cross section of Freudenberg's cystoscope. *A*, optical portion of an ordinary cystoscope; *B,B*, used more than portion *A* for the optical portion of Freudenberg's cystoscope; 1 and 2, ureteral catheters.

other instruments. Finally, the bladder can be irrigated with this cystoscope without removing the entire apparatus.

Baer's Cystoscope.—The principle of this instrument[6] is based on the fact that the lamp is open on two sides. The optical apparatus is

easily interchangeable, and permits the examination of the entire vesical cavity, of simple or double ureteral catheterization, and even of a few intravesical maneuvers. The many adaptations of this cystoscope explain the name "universal cystoscope" which is generally given to it. But it is hard to keep it in order. It is preferable by far to have several cystoscopes each of which should be used for its own special purpose.

Apart from the cystoscopes just mentioned, the manufacturers have in recent years devised a series of improved models in which the visual field has been enlarged and the employment of relatively large ureteral catheters made possible. However, No. 8 is generally a maximum size, beyond which it is difficult to pass. Likewise, double catheterization of the ureters has undergone considerable improvement with prismatic cystoscopes, with the result that this important procedure is being carried out with comparative facility. [American cystoscope makers have made wonderful progress in the past few years in this industry and are now providing unrivalled instruments for examination, catheterization, and intravesical operative purposes. Only within the last few months, one manufacturer has put on the market a universal instrument, having a comparatively small caliber, which, nevertheless, has a large visual field, a strong illumination, and a single shaft which can be utilized for all cystoscopic purposes, thus making it possible to perform all endovesical work with this single instrument.—EDITOR.]

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[4]Albarran: Maladies chirurgicales du rein et de l'uretère, in Traité de Chirurgie, by Le Dentu and Delbet, Paris, 1899, viii, 608.
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[6]Baer: Un nouveau cystoscope, Tr. Assn. franç. d'Urol., 1904, p. 802.

URETERAL CATHETERS

There are three types of ureteral catheter which are most commonly used; i. e., with an olivary tip, with a round end, and with a flutelike beak. These models are very much to be preferred especially when dealing with a normal ureteral orifice. Catheters with an olivary tip are particularly convenient for ureteral orifices which are narrow, strictured or otherwise diseased, for they can be inserted more easily than the other types. The flute-tip catheters are especially desirable for therapeutic purposes. The catheter is generally about 70 centi-

meters in length, and is usually graduated in centimeters. The caliber varies from No. 5 to No. 8; the sizes most commonly used are Nos. 6 and 7.

TECHNIC OF URETERAL CATHETERIZATION WITH THE INDIRECT CYSTOSCOPE

To practice catheterization with the cystoscope, certain systematic steps are essential. These are described by Albarran, as follows:

1. **Preparation of the Instrument.**—All the parts are sterilized,—cystoscope, catheters, forceps, electric conducting wires,—in a formalin sterilizer. The hands of the operator are sterilized as if for an operation. The instrument is thoroughly tested in all its parts. It should

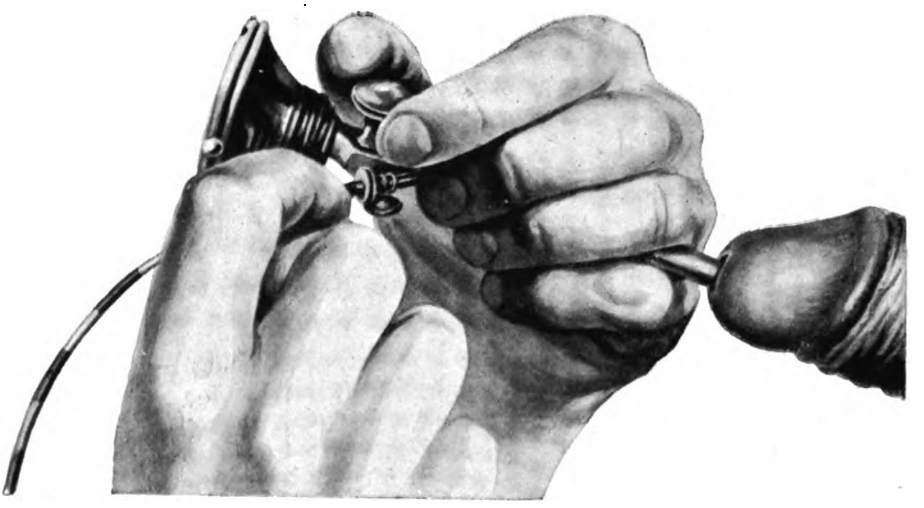

Fig. 177.—Position of the cystoscope and the hands in catheterizing the left ureter (Gorodichze and Hogge).[1]

be well cleaned and the lamp in perfect order. The catheter is inserted into the ureteral canal, care being taken to have it well lubricated with glycerin so that it will slide in easily.

2. **Preparation of the Patient.**—In the male, the operator should be assured that the caliber of the urethra will admit a No. 25 French sound easily. In both sexes the bladder is washed out thoroughly so as to secure as clear a visual field as possible; it is then filled with 150 to 200 c.c. of boric solution, the minimum amount of fluid for cystoscopy being from 50 to 60 c.c.

3. **Introduction of the Instrument.**—The tip of the instrument is lubricated with sterile glycerin and introduced into the urethra like an

ordinary sound, while an assistant protects the catheter from external contact.

4. **Finding the Ureteral Orifice.**—The cystoscope is introduced far enough for its tip to be free in the bladder. The beak is then turned downward and outward, giving it an inclination of about 30 degrees to the horizontal. The lamp is then lighted and the ureteral orifice will quickly be seen.

5. **Getting the Ureteral Orifice Into the Visual Field.**—When the ureteral orifice has been found, it is well to fix it so that the introduction of the catheter will be made more easily. In a general way the button attached to the ocular of the cystoscope may be used as a guide

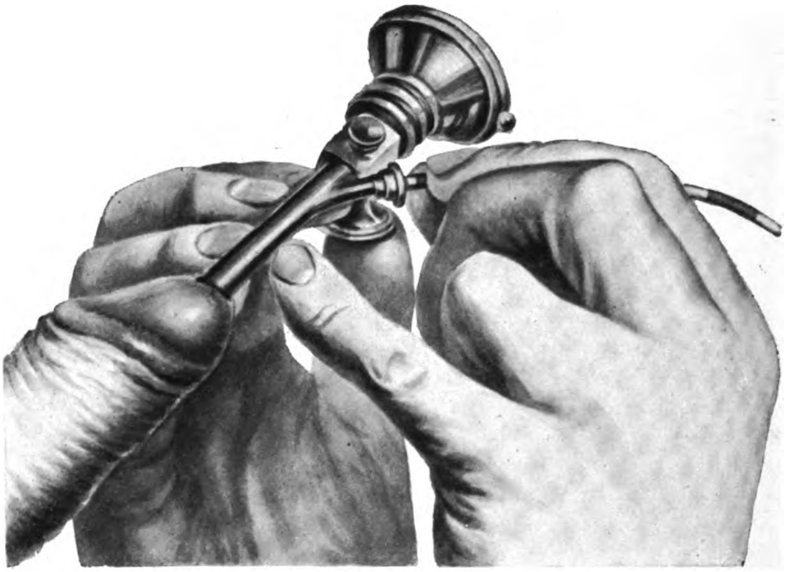

Fig. 178.—Position of the cystoscope and the hands in catheterizing the right ureter (Gorodichze and Hogge).

to bring the ureteral orifice and the beak of the instrument as closely together as possible. The latter will be very near the ureteral orifice, and the catheter, in emerging from the cystoscope, will have a relatively short passage to make to enter the ureter.

6. **Position of the Surgeon's Hands.**—At this moment the position of the operator's hands is important. One hand holds the cystoscope in position and manipulates the wheel which controls the deflector; the other hand inserts the catheter.[1] In catheterizing the right ureter, the right hand controls the cystoscope and deflector and the left inserts the catheter; for the left ureter, the left hand controls the deflector and the right inserts the catheter. In a general way, it is well to use both

hands simultaneously; that is, while one hand is inserting the catheter, the other hand, at the same time, controls the movements of the deflector and thus guides the catheter.

7. **The Ureteral Catheter is Inserted Gently.**—The catheter appears in the visual field, and as above described, the deflector is lowered so that the tip of the catheter is seen near the prism, considerably magnified.

Fig. 179.

Fig. 180.

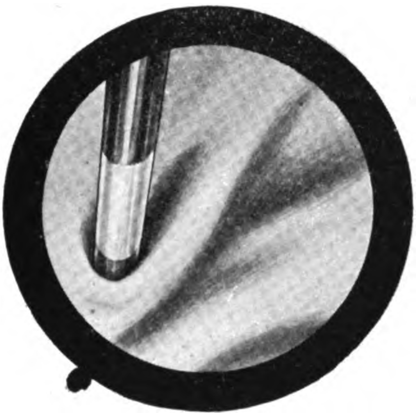

Fig. 181.

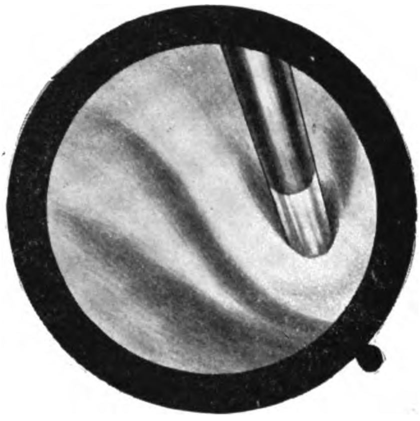

Fig. 182.

Fig. 179.—Ureteral catheter in favorable position for easy entrance into the ureteral orifice.

Fig. 180.—Ureteral catheter in poor position, and can not enter the ureteral orifice without great difficulty.

Fig. 181.—The ureteral catheter has entered the right ureter. The button indicator on the cystoscope is well placed (at eight o'clock). The ureteral orifice is in line with its prolongation (Gorodichze and Hogge).

Fig. 182.—The ureteral catheter has entered the left ureter. The button indicator on the cystoscope is well placed (at four o'clock). The ureteral orifice is in line with its prolongat on (Gorodichze and Hogge).

8. **The Catheter Tip is Inclined in the Direction of the Ureteral Orifice.**—The tip of the catheter, gently pushed forward and bent by

the deflector, as desired, recedes from the prism, becomes smaller and enters the ureteral orifice.

9. **The Catheter Penetrates the Ureteral Orifice.**—This is perhaps the most delicate movement in ureteral catheterization. Using both hands, as above suggested, the cystoscope is raised or lowered at the same time so that the catheter will enter the ureteral orifice more easily. The tip of the catheter should be given the same direction as the ureter (Fig. 179) to avoid its striking the bladder wall, which will happen if the tip is too high or too low or in front of or behind the orifice (Fig. 180).

The ureteral catheter having entered the lips of the meatus, it is an easy matter to advance it up to the pelvis. It is well, for a moment, to leave the deflector in the position which has facilitated the introduction of the catheter; it will then be found much more convenient to lower the deflector, as this enables the catheter to slide more easily into the ureter. Otherwise the catheter may rub against the ureteral wall and unforeseen accidents may occur.

On the other hand, when the operator is assured that the ureteral catheter has penetrated its entire length without difficulty, he may be certain that its tip has reached the pelvis. In order to determine when the advance of the catheter should be stopped, the best criterion is either to judge by the resistance felt by the hand, or as is most often the case, by the fact that its progress has ceased and that it bends upon itself at the ureteral orifice. This bending of the catheter at the orifice indicates that its extremity has reached the pelvis; it is well to withdraw the catheter at this point one or two centimeters, so as to prevent injury to the renal parenchyma.

10. **Withdrawing the Cystoscope and Leaving the Catheter In Situ.**—The catheter being in position, the deflector is lowered so that it lies flat against the cystoscopic tube. This precaution is absolutely essential, and one not to be forgotten, in order to avoid injury to the urethra and the severe pain that accompanies it. Next, the lamp is extinguished, by turning off the current. This done, the cystoscope is depressed in line with the axis of the body, one hand feeds the ureteral catheter into the cystoscope, while the other withdraws the tube. When the beak of the cystoscope has reached the meatus, the ureteral catheter is grasped with two fingers, while the operator withdraws the cystoscopic tube and thus leaves the catheter in place.

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URETERAL CATHETERIZATION WITH THE DIRECT VISION CYSTOSCOPE

Grünfeld, of Vienna,[1] seems to have been the first to practice catheterization of the ureter with a direct vision cystoscope. His instrument consisted of a metallic tube blackened inside, with a mirror placed at its extremity. A frontal mirror with an electric lamp, provided the luminous rays and revealed the ureteral orifices.

For ureteral catheterization, Grünfeld made use of a special catheter, the caliber of which was No. 6 Charrière, and which he introduced into the bladder, not through the endoscopic tube, but along its exterior wall. This catheter was traversed by a metallic wire which terminated at one of its extremities in a ring, by which the wire could be pulled. Two other fixed rings formed a fulcrum. The other extremity was jointed in such a manner that the catheter could be bent more or less and made to assume a variable acute angle with the rest of the catheter.

The tube was introduced into the urethra. Next the catheter was inserted into the bladder, in such a manner that the catheter was placed on the left side of the tube when the right ureter was to be catheterized, and vice versa. The operator then sought the ureteral orifice through the endoscope, and when it was found, the catheter was gently inserted into the meatus. The endoscope was next easily withdrawn from the urethra, and the catheter left *in situ.*

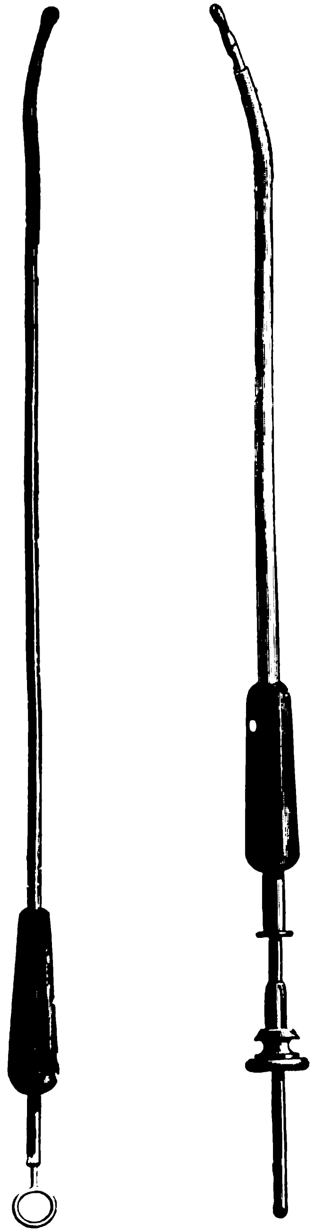
Pawlick, in 1896,[2] catheterized the ureter with a method different from that which he first used; this consisted of an endoscopic tube which we have already described (see page 58), with which he could see and catheterize the ureteral orifices with the aid of the special catheter shown in the accompanying illustration (Fig. 183). He even published numerous reports in which he was able to apply his procedure, but only in the female.[3]

Kelly's Method.—Howard Kelly, of Baltimore, has rendered most important service to the subject of direct ureteral catheterization, through his many publications, their important character, and their study of the most minute details. We shall not now describe his instrument, as it has already been fully described on page 57, but shall merely discuss its bearing on the subject of ureteral catheterization.

The patient being in the genupectoral position, the important thing is to discover the ureteral orifices. Kelly gives his tube an oblique inclination of about 30 degrees, and by making it vary slightly, and by watching carefully, the ureteral orifices can thus be seen. The ureteral catheter is then introduced and advanced gently as far as the kidney.

The greatest difficulty in this procedure is that of recognizing the

ureteral orifice. This end will be aided by the use of an explorer or searcher, a sort of fine stylet, provided with a smooth and slightly



A. B.

Fig. 183.—Pawlick's ureteral catheters.

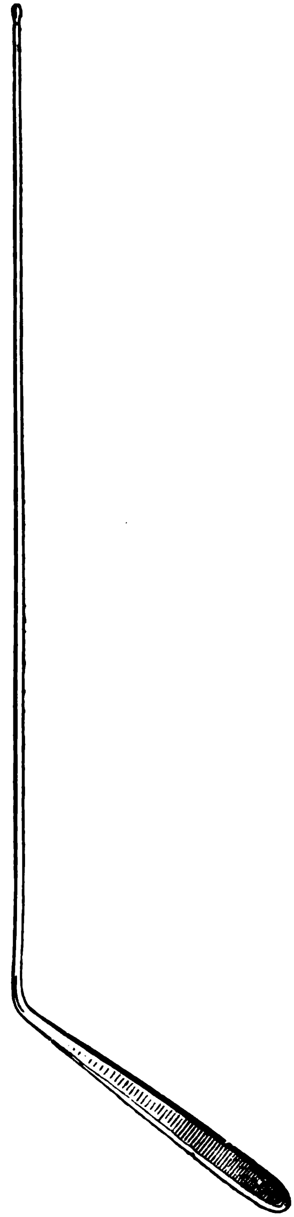


Fig. 184.—Kelly's ureteral explorer.

curved end, and a little bent handle (Fig. 184), which does not interfere with the operating view.

Evacuation of the urine is also a difficult matter. Kelly removes the urine either with a metallic catheter provided with a rubber bulb, or with cotton tampons. These manipulations do not completely remove the urine, however, and necessitate a considerable loss of time.

However this may be, we must see the skill and dexterity with which Kelly himself catheterizes the female ureter, before we can understand how even with his skill this procedure can be of any value.

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[1]Grünfeld: Die Endoskopie der Harnröhre und Blase, Deutsche Chirurgie, von Billroth und Luecke, 1881, No. 51, special, p. 211.

[2]Pawlick: Zentralbl. f. Gynäk., 1896.

[3]Pawlick: Rev. de gynéc. et de chir. abd., Sept.-Oct., 1897, pp. 787-823.

TECHNIC OF URETERAL CATHETERIZATION WITH LUYS' DIRECT VISION CYSTOSCOPE

The operative technic of my cystoscope has already been described (see page 229). It is therefore not necessary to repeat it at this time. The patient being in the inclined position, and the cystoscope in the air-distended bladder, the first step is to find the ureteral orifices.

Finding the Ureteral Orifices.—While it is quite easy for the experienced, the search for the ureteral orifice is much more difficult for the beginner. One must know the exact topography of the bladder, which takes on a rather special significance under the action of the inclined position of the pelvis.

The most valuable guide in finding the ureteral orifices immediately, is this: The cystoscopic tube is inserted into the bladder up to the posterior wall. When the tube is withdrawn horizontally, we see first only the posterior wall, because the floor of the bladder lies directly under the tube; withdrawing the tube still further, the floor, very deep at first, now comes into view suddenly. There is a very clear-cut line of demarcation at this point, which is very easy to observe; and it is precisely when this moment is reached that one can be certain of being directly upon the interureteral ligament. Consequently, by slightly inclining the tube to the right or to the left, the corresponding ureter will be found.

Let us hasten to add that the most common fault in this procedure usually consists in inclining the tube too much to one side. As a general rule, it may be said that the orifices are not far from the median line, but the tendency is to get too far away from them.

While the discovery of the ureteral orifices is a simple enough

PLATE XVII

Fig. 1.—*Urethral aspect of polypi on the neck of the bladder.* These polypi *could not be* recognized except through the direct vision cystoscope, by the aid of which both urethral and vesical aspects of the bladder neck can be examined.

PLATE XVII

matter under normal and usual conditions with this procedure, it is altogether different in acute cystitis, or when the vesical wall is granular, or inflamed, and bleeds at the slightest contact, or when manipulation is very painful.

Certain rather special procedures will then become necessary:

First, it will be necessary to control the pain. The bowels having

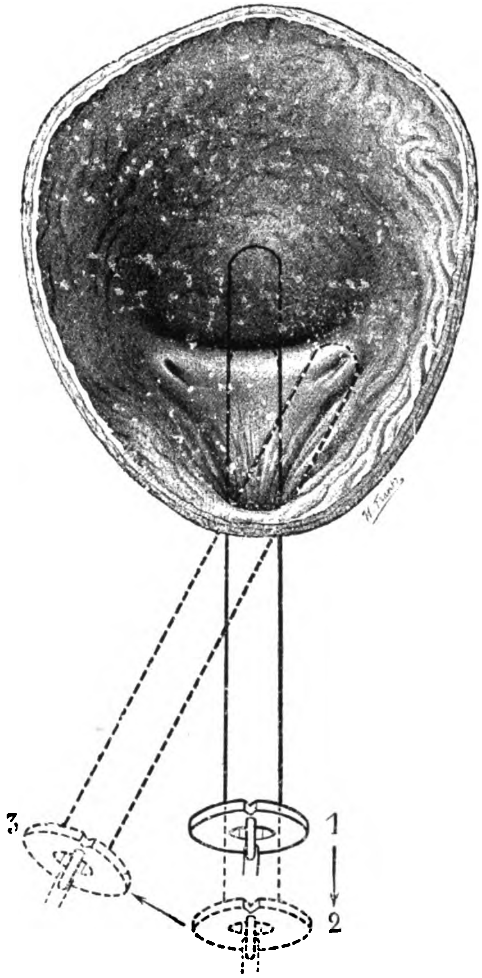

Fig. 185.—Finding the ureteral orifices with Luys' direct vision cystoscope, the bladder being dilated under the influence of the inclined position. The endoscopic tube is first introduced into the fundus of the bladder, in first position; then it is gradually withdrawn to second position; suddenly, the fundus reappears toward the tube; it is now at the interureteral ligament, which is a most valuable guide. All that is now necessary is to incline the tube laterally somewhat and place it in third position, and the ureteral orifice will surely be found.

been emptied, the patient is given a retained enema, half an hour before the examination, consisting of one or two grams of antipyrin and twelve drops of laudanum. Sometimes this is insufficient; the bladder,

being highly sensitive, rebels at the slightest contact, thus making an examination extremely difficult if not altogether impossible. In these conditions it may become necessary to resort to hypodermic injections of morphine or of scopolamine, as has been recommended by Terrier.

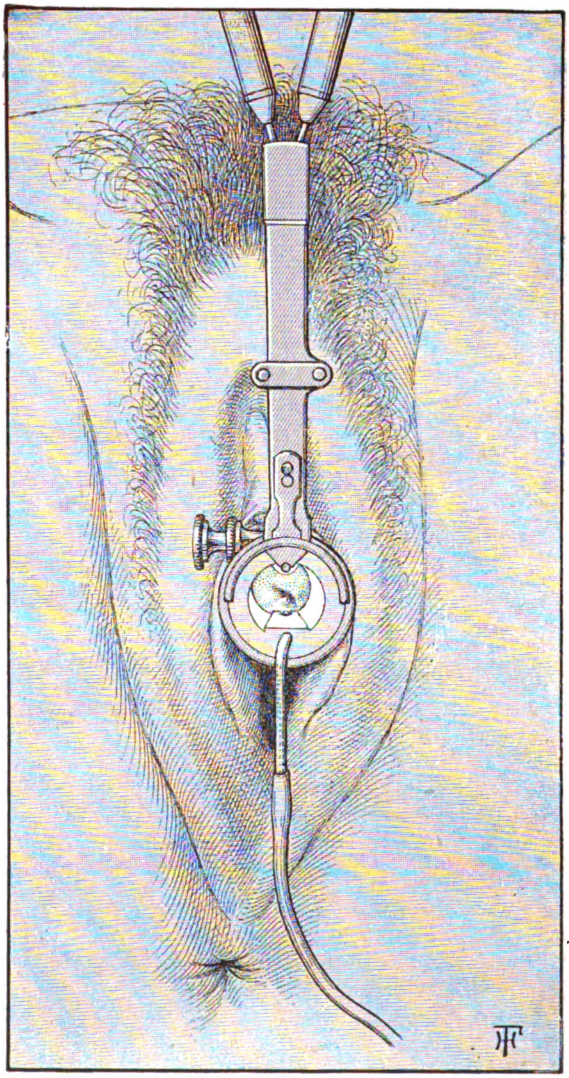

Fig. 186.—View of the left ureteral orifice magnified by the lens of Luys' direct vision cystoscope.

I have had occasion to apply the last mentioned procedure with great success in the service of J. L. Faure, in a patient of Lapointe's. The bladder was particularly painful, but with this method of anesthesia, it was possible to catheterize the ureters.

Second, it will often be necessary to control the bleeding of the vesical mucosa. When the cystitis is very pronounced, the vesical wall bleeds at the slightest contact, and the blood completely obscures the field of vision; it is then impossible in spite of the repeated use of cotton tampons, to distinguish the details of the vesical mucosa clearly. In these circumstances it may be extremely difficult to find the ureteral orifices.

A very simple procedure will overcome these difficulties. Having stanched the blood with a cotton tampon, it is usually sufficient to

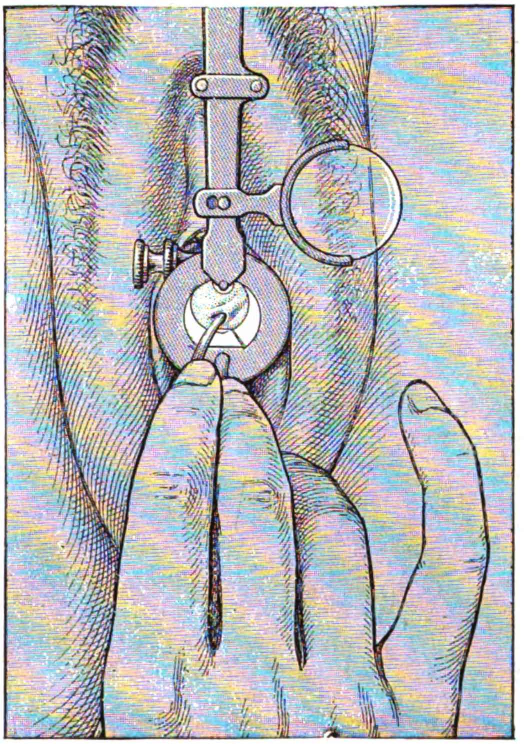

Fig. 187.—Direct catheterization of the left ureter. When the ureteral orifice has been well located, a ureteral catheter enters the ureter easily.

apply to the bleeding point, another tampon saturated with a 1:1000 adrenalin solution, in order to make certain after some moments, that all bleeding has ceased. Great care is necessary, however, for this step to have a proper effect. It is absolutely essential that the adrenalin be placed only on the actual bleeding point; this agent is effective only when applied to the bleeding spot.

Third, the ureteral orifice may not be located, although the extremity of the cystoscopic tube has been directed exactly upon the point which should normally correspond to the ureteral orifice. In such a

Fig. 188.

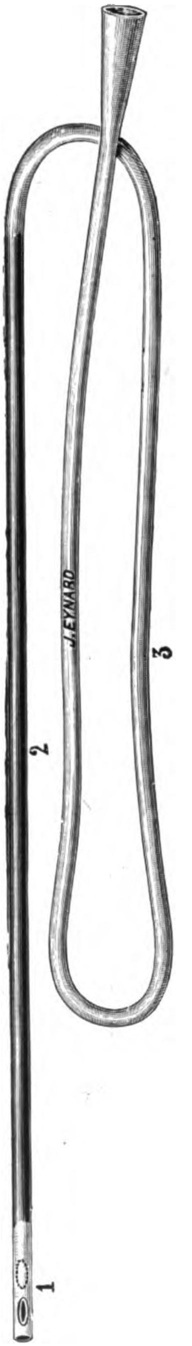

Fig. 189.

Fig. 188.—Small catheter provided with a metallic stylet for direct catheterization of the ureter in the female.

Fig. 189.—Ureteral catheter devised especially for direct catheterization of the ureter.

case, it is well to stretch the vesical mucosa by depressing it with the tip of the cystoscopic tube. In this manner, a ureteral orifice is revealed, which was hidden behind a fold of the mucosa, and was thus inaccessible at the first examination.

Another procedure is to wait for the ureteral ejaculation, which acts as a guide toward the source of the jet; in this way, the ureteral meatus can often be located.

Fourth, there are cases in which, in spite of all patience and care,

Fig. 190.—Direct ureteral catheterization in the male.

the operator does not succeed in locating the ureteral orifice. In these assuredly rare cases, the method recommended by Voelcker and Joseph, for prismatic cystoscopy should be adopted. Ten minutes before the examination, a subcutaneous injection of 4 c. c. of a sterile 4 per cent solution of indigocarmine is given. The urine is thus colored dark blue at the end of fifteen minutes, and at the moment of ejaculation it is easy to see the exact point at which the colored urine emerges; namely, the ureteral orifice.

Ureteral Catheterization (Luys).—When the ureteral orifice has been located, it is well to place the lower margin of the cystoscopic tube directly in contact with it (Plate XIII, Fig. 2). The cystoscope is then fixed firmly with the left hand, while the sterile ureteral catheter is introduced with the right. The catheter is directed along the floor of the tube and quite naturally enters the ureteral orifice in the easiest possible manner, progressing as far as the pelvis and kidney. This entire procedure appears to be extremely simple and remarkably easy of performance.

The sole precaution to be taken is to have a very straight and rigid ureteral catheter. When the catheter is new, this condition is usually present; but after it has been used some time, it becomes soft and it no longer has the necessary rigidity to advance beyond the ureteral meatus.

In these circumstances we place a fine stylet of wire within the lumen of the catheter. This stylet must not extend to the end of the catheter in order that the catheter tip shall be yielding, and not dangerous, still sufficiently rigid so that it will not strike the ureteral orifice and bend on itself. Once the tip of the catheter has engaged in the ureter, the stylet is withdrawn and the catheter is advanced into the ureter as far as the pelvis, if so desired. The handle of the cystoscope is withdrawn, and with it comes the cystoscopic tube proper.

For ureteral catheterization in the female, we use a short straight ordinary catheter, No. 5, 6, or 7, which is usually sufficient for collecting the separate urines, or for examination of the lower extremity of the ureter.

I have devised a special ureteral catheter for the male, so as to obviate the use of the stylet. The catheters most commonly used correspond to Nos. 7, 8, or 9, Charrière; their tips are cut blunt and have two eyes laterally. Their tip is soft and flexible for a distance of one centimeter; then for about fifteen centimeters they are of a little harder substance, which is more resistant and capable of furnishing sufficient rigidity. The rest of the catheter is flexible and ends in a broad funnel, to which the cannula of a syringe can be attached. These catheters penetrate very readily into the ureter and facilitate lavage of the pelvis.

In actual practice, however, these catheter models are not indispensable, and in the vast majority of cases, even in the male, ordinary ureteral catheters can be used, provided they have a fine stylet which is well lubricated and particularly smooth and clean. Operating in this way, ureteral catheterization really becomes very easy, and with experience, can be performed very rapidly.

The picture of the ureteral orifices seen with the direct view cysto-

scope is so clear and distinct, that general surgeons and obstetricians who do not specialize in urinary surgery, readily succeed even after the first attempt. Thus Bar, who had never examined the bladder with a cystoscope, and had never catheterized the ureters, was able to catheterize at the very first trial. In the same way, Lapointe, a surgeon in the hospitals of Paris, also wrote me on August 11, 1906, that he had catheterized both ureters in a normal bladder with my instrument with the greatest ease.

Pierre Delbet reported to the Surgical Society,[1] "The ureteral orifices are readily seen; and as the ureteral ejaculation takes place in an empty bladder, distended only by air, each drop of urine is seen with extraordinary clearness. In a case in which it was not at all necessary, I was tempted childishly to insert a catheter into the ureter simply for the pleasure of doing so, and it was done just as easily as insertng a probe into a cutaneous fistula."

I therefore believe that it is infinitely preferable to catheterize with the direct cystoscope, than across a cystotomized bladder, as has been suggested by Legueu.[2] One can always see better in the closed bladder with my cystoscope than in the open bladder, without, at the same time, assuming the risk of an operation.

The following are reports of a few cases in which this method was especially useful:

CASE 1.—*Left Pyonephrosis: Examination of the Separate Urines Showed an Absence of Left Kidney Function; Direct Catheterization of the Left Ureter Showed the Exact Site of the Obliteration.*

A woman, aged forty years, entered the service of Beurnier, at Tenon Hospital, in November, 1904. She presented a large tumor in the left hypochondrium; it was movable transversely, but very little vertically, and was suggestive of a floating kidney. The urine was clear, and bladder capacity excellent. The previous history showed attacks of nephritic colic for a long period, and always on the left side. Vaginal examination showed that the inferior extremity of the left ureter was distinctly painful.

Endovesical separation of the urine on November 23, made by me, gave the following data: On the right side, clear urine, with distinct ureteral ejaculation; on the left side, not a drop of urine. The conclusion was evident that the entire clear urine was being furnished by the right kidney, and that the left kidney had no functional value because its ureter was obliterated.

In order to determine the exact site of the obstruction, I catheterized the left ureter with my cystoscope, with the aid of Rabinovitch, intern of the service, on November 29. The right ureteral orifice was absolutely normal; the left orifice, on the contrary, was red, puffy, and surrounded by a very pronounced inflammatory zone. Nevertheless, this orifice was immediately catheterized with the greatest ease, as soon as it was located. The catheter penetrated easily into the ureter, but was obstructed at a point about 24 centimeters from its orifice, and it was impossible to advance it any further. It bent and twisted under the eye in the cystoscopic tube, and made no further progress. It was noted that no urine came through the orifice, not even when aspiration was attempted at the free end of the catheter. The action of the piston proved that there was an actual vacuum in the lumen of the catheter; the latter, on later examination, was found perfectly patent.

We were, therefore, dealing with an obliteration of the left ureter near the kidney.

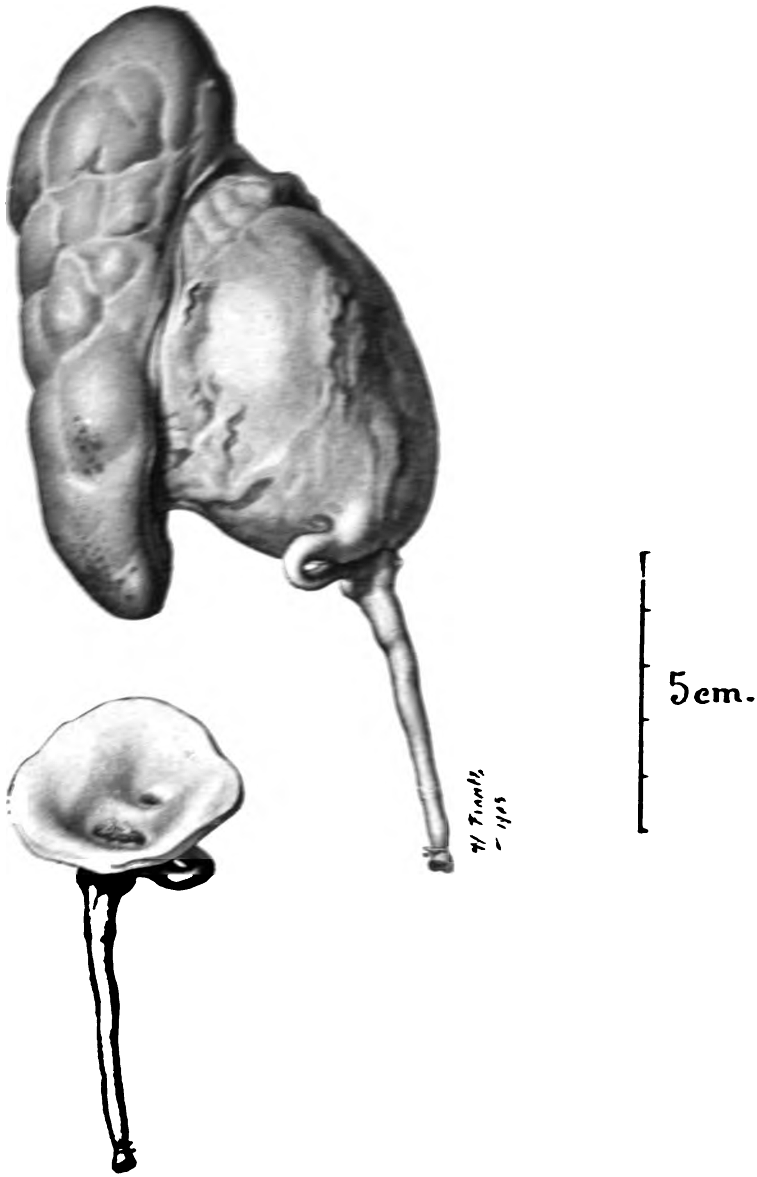

Fig. 191. Enormous distention of the renal pelvis, the parenchyma much reduced; uretero-pyelo-anastomosis, followed by secondary nephrectomy. The uretero-pyelo-anastomosis is clearly seen at the lower pole of the pelvis; the small figure shows the interior of the pelvis with two orifices; one is the normal orifice of the ureter; the other is the pyeloureteral opening, with the catgut sutures still visible.

This diagnosis was confirmed at operation on the following day. Beurnier performed left lumbar nephrectomy and found a closed pyonephrosis; the ureter was completely obliterated by the perinephritis. The specimen is preserved in my private collection.

CASE 2.—*Intermittent Hydronephrosis: Separation of the Urines during the Period of Retention; Ureteropyeloneostomy; Direct Ureteral Catheterization; Nephrectomy.*

On Dec. 8, 1904, Tuffier asked me to effect separation of the urines in a woman twenty-five years of age, who had entered his service at Beaujon Hospital two days previously. She complained of extremely severe pain, resembling renal colic, and always on the left side. These painful attacks began nine years previously, at the age of sixteen. During these attacks, a large tumor formed in the left hypochondrium, while at the same time, urinary

ORDINARY DIET

	RIGHT KIDNEY	LEFT KIDNEY
From 10 to 10:45 A.M.	$V = 155$ c.c.	$V = 27$ c.c.
	$\Delta = -1.21°$	$\Delta = -0.24°$
From 2 to 2:45 P.M.	$V = 150$ c.c.	$V = 25$ c.c.
	$\Delta = -0.78°$	$\Delta = -0.26°$
From 4 to 4:30 P.M.	$V = 60$ c.c.	$V = 30$ c.c.
	$\Delta = -1.12°$	$\Delta = -0.20°$

PARTIAL MILK DIET

	RIGHT KIDNEY	LEFT KIDNEY
12 to 12:45 Noon	$V = 100$ c.c.	$V = 30$ c.c.
	$\Delta = -0.85°$	$\Delta = -0.21°$
1 to 1:45 P.M.	$V = 96$ c.c.	$V = 27$ c.c.
	$\Delta = -0.86°$	$\Delta = -0.25°$
4 to 4:45 P.M.	$V = 105$ c.c.	$V = 32$ c.c.
	$\Delta = -0.86°$	$\Delta = -0.22°$

V = Volume. Δ = Freezing point (in Cryoscopy).

secretion diminished in quantity. This phenomenon lasted several hours, at times, several days. The attack usually ended with a profuse emission of urine, cessation of the pain and disappearance of the abdominal tumor. The passage of a stone was never observed. The urine was continually clear, and there was never any trace of blood.

When I first saw her, she was in the midst of one of these attacks. A large tumor was felt in the left hypochondrium, movable, kidney-shaped, and strongly suggestive of a floating kidney. The urine collected with a catheter was absolutely clear. The urine separator was introduced easily and left in place for fifteen minutes; the right side showed rhythmic and regular emissions, although somewhat slow, for the patient had taken nothing during the entire morning; on the left side, on the other hand, not a single drop of urine was passed during that entire period. An assistant who attempted to push the tumor upward toward

the diaphragm, met with no success. When an attempt was made to grasp the tumor between the two hands, the same negative result followed.

The diagnosis was therefore very evident,—a closed uronephrosis. Tuffier operated immediately after this examination. The left kidney was exposed, but as it was too large to be delivered into the wound, it was first punctured; more than half a liter of fluid escaped. The pelvis was then freed and was found enormously dilated, and the ureter which followed it was small and kinked near its origin. Tuffier did a pyeloureteral anastomosis, connecting the lower end of the pelvis with the ureter (Fig. 191). The operation was finished in the usual manner.

For eight days the patient progressed very nicely, but a lumbar fistula then formed, and almost all the urine was eliminated through the lumbar wound. The dressings were soaked with urine continually. To remedy this condition, I catheterized the left ureter on December 27, with great facility, and the ureteral catheter was left *in situ* for two days. On January 3, 1905, the patient was in good general condition. The lumbar wound was almost closed and no urine passed through it.

During the forty-eight hours in which the catheter was left in the ureter, the separated urines were examined chemically by Mauté, and showed that the functional value of the left kidney was almost nil. The table on page 279 shows the analyses.

In view of these findings, which demonstrated a complete functional insufficiency of the left kidney, Tuffier decided to perform nephrectomy. This proved to be very difficult because of the strong adhesions that had been formed. The renal parenchyma was found extremely diminished; the pelvis was dilated to double the size of the kidney. A probe introduced into the lower part of the ureter penetrated directly into the pelvis across the newly formed opening; at the side of this new opening, the former ureteral orifice was seen, normal in size (Fig. 191).

By means of a minute dissection of the entire ureteral canal, it was possible to follow the canal from its origin at the pelvis up to the ureteral anastomosis, and it was found twisted upon itself in the form of a loop. A probe could not be passed from the normal ureteral orifice to its lower extremity because it was stopped at the uretero-pyelo-anastomosis.

From this case, therefore, we may draw these conclusions:

1. Separation of the urines demonstrated that the kinked ureter did not allow the urine to pass through, for not a drop of urine had been collected from the left side.

2. The uretero-pyelo-anastomosis did not reestablish the urinary flow completely, because a lumbar fistula developed eight days later.

3. Ureteral catheterization opened a channel for the urine, for the lumbar fistula healed under this treatment. Besides, the analysis of the urine from the affected kidney collected for a period of twenty-four hours showed that the kidney had no functional value whatever.

4. Nephrectomy demonstrated that although the ureteral lumen was absolutely patent in its entire course, from its origin at the pelvis to its new ureteral orifice, nevertheless it flowed incompletely through the ureter because the pelvis was found full of urine at the second operation.

The patient left the hospital on January 29, 1905, cured. The specimen is preserved in my private collection.

CASE 3.—*Tuberculosis of the Right Kidney: Recognized by the Luys' Separator and Confirmed by Direct Ureteral Catheterization.*

A woman, aged twenty-eight years, was brought to me on November 30, 1905, by Noguès, who wrote the following report of the case:

She had complained for over a year, of frequent urination, with pain and slight hematuria at the end of the act. The urine, examined by Noguès, contained numerous tubercle bacilli. Vesical capacity 80 c.c. She voided six to eight times during the night.

There was no pain in the kidney region, nor any increase in the size of the kidney. Endovesical separation, made by Noguès with Luys' separator, gave this picture: On the left, clear urine; on the right, more abundant urine, paler, turbid, and tubercle bacilli present. Indirect cystoscopy showed a normal bladder. However, the right ureteral orifice is not sufficiently visible to me, to make it worth while to attempt catheterization. Consequently the patient was taken to Luys, who easily introduced a catheter into the right ureter with his direct cystoscope, in the presence of the writer.

A flow of pus showed that the catheter had penetrated into the purulent pocket of the right kidney, and thus had accomplished its object. Subsequently, the patient was operated on at Necker Hospital, and recovered rapidly without untoward incident. Nephrectomy revealed three pus cavities, thus fully verifying the diagnosis made by the cystoscope and catheter.

CASE 4.—*Right Pyonephrosis and Acute Cystitis: Urinary Separation Impossible, Except by Direct Ureteral Catheterization.*

I was called upon to catheterize the ureters in a woman, aged thirty-five years, in the service of Hartmann, at Lariboisière Hospital, on April 17, 1905. She showed clinical symptoms of right pyonephrosis. The kidney was palpable, and the right ureter was also felt very much enlarged. But inasmuch as the left kidney was also palpable, but to a lesser degree, segregation of the urines seemed indicated. The symptoms of cystitis were so acute, however, that an endovesical separation of the urines could not be considered. The urine was turbid, with a purulent precipitate, and in addition, the urine was voided every fifteen minutes, with hematuria every two or three days. Catheterization by means of the indirect (prismatic) cystoscope was also out of the question, because of the very small vesical capacity.

With the aid of the direct cystoscope, I catheterized the right ureter in a few minutes without any difficulty; the endoscopic tube having been withdrawn, the right ureteral catheter remained *in situ*, and a Nélaton catheter was introduced into the bladder. This separation of the urine gave the following results:

The ureteral catheter which drained the right kidney gave an absolutely purulent milky white fluid; while the catheter in the bladder, which collected the urine from the left kidney, produced urine that was bloody, but not quite so thick as the urine from the right side.

CASE 5.—*Uretero-pyelo-anastomosis: Direct Catheterization of the Operated Ureter Showed Distention of the Pelvis.*

A woman, having been subjected to a left uretero-pyelo-anastomosis by Robineau, in the service of Tuffier, for symptoms of uronephrosis, later developed a lumbar fistula. On May 2, 1905, in order to correct the improper drainage of the new ureteral mouth, Robineau asked me to catheterize the left ureter. Direct catheterization was performed easily, and demonstrated that the pelvis was considerably dilated and had a capacity of about 150 c.c.

CASE 6.—*Attacks of Left Hydronephrosis: Catheterization of the Left Ureter Suggesting the Presence of a Ureteral Calculus.*

A woman, aged twenty-five years, entered the Tenon Hospital, in the service of Rochard, in March 1905, complaining of violent, painful attacks in the left hypochondrium, which recurred frequently at intervals varying from four to fifteen days. These attacks first appeared four years previously. During the crises, a mass appeared at the left hypochondrium coincident with a considerable decrease in the quantity of urine passed. A preliminary examination by direct cystoscopy, on March 14, showed the right ureteral ejaculations very clearly, but on the left side, on the contrary, although the orifice was distinctly visible, not a drop of urine was ejaculated.

The left kidney was clearly felt on bimanual palpation; it was easily reducible and

also quite painful. On March 24, after many attempts at catheterization of the left side, a ureteral catheter No. 6, was easily introduced, with some interruptions at first. With the aid of a stylet inserted into the lumen of the catheter, it penetrated as far as the pelvis; the capacity of the latter proved to be about 25 c.c. While the catheter was being withdrawn, a sensation of friction was distinctly felt; this justified the suspicion of a ureteral calculus. The patient was sent to the radiographic department, but unfortunately the case could not be followed up thereafter.

CASE 7.—*The Right Kidney Alone Clinically Affected: Intravesical Separation and Catheterization of the Ureters Show Both Kidneys Affected, a Contraindication to Right Nephrectomy. (Courtesy of Lapointe.)*

M., a woman, aged thirty-two years, was referred to Lapointe, at Tenon Hospital, on May 10, 1905, by Barbellion, who had been treating her for several months for cystitis and enlargement of the right kidney. The patient had had trouble with her right kidney from infancy, but apart from these symptoms, she had not had any previous serious illness. Several cervical scars, however, resulting from an old suppurative adenitis, were observed. It was also noted that her father had died of pulmonary tuberculosis at the age of forty.

During pregnancy, eighteen months previously, she complained of frequent and painful micturition. At the same time, the pains in the right kidney increased considerably and the patient noticed a swelling on the right side. This mass alternately increased and decreased coincidently with the increase and decrease of the painful manifestations. From that time on, the urine became turbid, but without any hematuria.

Late in 1905, Barbellion began to treat the bladder, which was very sensitive, by instillations of silver, and subsequently with guaiacol oil and gomenol. Under this treatment, the urinary frequency and the pain diminished, but the kidney remained large and sensitive.

When she entered the hospital, the urine was turbid and purulent, but without blood; frequency every hour. The bladder was extremely sensitive to contact and to distention. Its capacity was only about 30 c.c. On palpation, the right kidney was found as large as both fists, lowered in position, irreducible, painful on pressure and fluctuating.

The vesical portion of the right ureter was thickened and painful on vaginal examination. The left kidney was not palpable. To complete the diagnosis and determine the advisability of right nephrectomy, Lapointe employed the Luys segregator, on May 16, 1906. The instrument was badly tolerated by the bladder, because of the bleeding and the small bladder capacity of 30 to 35 c.c. Nevertheless, a quantity of urine was collected, sufficient for the chemical examination, which was made by Carrion, with the following findings:

	RIGHT KIDNEY	LEFT KIDNEY
Quantity	3.06 c.c.	3.03 c.c.
Urea, per liter	3.20 gm.	2.56 gm.
Chlorides	4.68 "	4.68 "
Freezing point	0.54°	0.52°

Microscopic

Red blood cells, very numerous.	Red blood cells very numerous
Leucocytes, mostly polynuclear, very numerous.	Leucocytes much less abundant

Bacteriologic examination for tubercle bacilli, negative; the urine of both kidneys contains bacteria, some Gram positive and others negative. Most of them are diplostreptococci and microbes which appear to be coli bacilli. Two guinea pigs inoculated on May 17, with the right kidney urine, gave a negative reaction to tuberculosis.

We were, therefore, probably dealing with an ordinary infection; but the endovesical separation of the urine indicated that the left kidney, which was not enlarged, and was clinically normal, nevertheless, emitted slightly cloudy urine and that its rate of elimination was slower than that of the right kidney, which was clinically affected.

In order to confirm these unexpected data, Lapointe attempted the methylene blue test with ureteral catheterization, and used the Luys' direct view cystoscope for this purpose. After two fruitless trials, Luys was called in on May 26. To obtain relative tolerance of the bladder, Lapointe had injected scopolamine-morphine an hour before the examination, using this solution:

Scopolamine bromohydrate	½ mg.
Morphine chlorhydrate	1 cg.

The cystoscope showed that the bladder was considerably affected with fungous growths which bled on the slightest contact. The right ureteral orifice was seen in the midst of the fungosities and readily catheterized with a No. 8 catheter. It was much more difficult to reach the left ureteral orifice, for at this point the bladder bled profusely. However, the mucosa was thoroughly dried by the direct application of adrenalin and then the left ureteral orifice was seen, hidden at first, by a fold of the mucosa. To see it well it was necessary to flatten down the mucosa with the extremity of the cystoscopic tube, and a No. 7 catheter was then easily introduced.

As soon as the catheters were introduced into their respective ureters, a reflex polyuria was produced; the urine from both sides was cloudy. Previous to the ureteral catheterization, methylene blue was injected subcutaneously; the ureteral catheters were left *in situ* for two hours and during this period the methylene blue was being eliminated in the form of chromogen, as follows:

	RIGHT KIDNEY	LEFT KIDNEY
First hour	Nothing	Nothing
Third half hour	Distinctly green tint	Green tint much less marked than on right side
Fourth half hour	Not more pronounced	Not more pronounced

The urine passed by the patient was first examined for methylene blue seven hours after the injection and the total elimination persisted for about forty-eight hours. The left kidney then eliminated less chromogen than the right kidney. The study of the methylene blue elimination in both kidneys, by the aid of ureteral catheterization, is in full accord with the results of the chemical analysis and of cryoscopy made on the separated urines.

Conclusions.—Segregation of the urines demonstrated that the left kidney, which was thought to be healthy, was also diseased, and that its functional value was even inferior to that of the right kidney. The bacteriologic examination, negative as to tuberculosis, suggested a diagnosis of right hydronephrosis, the kidney having been infected probably by an intercurrent cystitis; also a secondary pyelonephritis of the left kidney.

The pathologic condition of both kidneys was a distinct contraindication to nephrectomy of the right kidney, and limited surgical intervention to nephrostomy; but the patient left the hospital on learning that her right kidney could not be removed.

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[2]Legueu: Du cathétérisme de l'uretère a travers la vessie ouverte, Press. méd., April 10, 1907, p. 226.

PLATE XVIII

FIG. 1.—*Phosphatic calculus of the bladder* pocketed in the inflamed mucosa.

FIG. 2.—*Phosphatic calculus of the bladder.*

FIG. 3.—*Tuberculous ulcerations of the bladder* seen with the direct vision cystoscope.

Fig. 1.

Fig. 2.

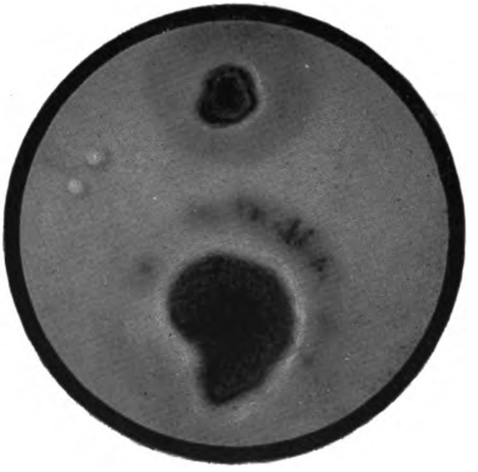

Fig. 3.

PLATE XVIII

CHOICE OF METHOD IN URETERAL CATHETERIZATION

Having thus examined successively all the methods and procedures for ureteral catheterization, it is well to inquire as to which method is to be given preference. It is evident that catheterization is to be performed either with direct or indirect vision cystoscopy. These two methods should not be set up one against the other, as rivals, inasmuch as each has its own special indications; one should supplant the other under certain circumstances.

Indications for Direct Vision Cystoscopy in Ureteral Catheterization

This method seems to be the method of choice and should be preferred above any other under the following principal conditions:

1. **For Catheterization of a Normal Kidney.**—When there is a special indication for obtaining exact knowledge of the condition of the ureter or of the pelvis of a kidney thought to be normal, it seems evident that only the direct vision cystoscope should be employed for catheterization.

We shall consider further on, the real and absolutely certain dangers of infection which arise in ureteral catheterization with the indirect method. These dangers are, on the other hand, reduced to a minimum, if not obviated entirely, with the use of the direct vision cystoscope.

With this method, the ureteral catheter emerges from the sterilizer and directly passes into the ureter, coming into contact only with the aseptic fingers of the surgeon. The only possible danger is found in touching the infected vesical wall with the catheter, if the hand is not experienced; but when the end of the cystoscopic tube is directly in contact with the ureteral orifice, it is a simple matter before introducing the catheter, to touch up the vesical wall surrounding the ureteral orifice with a 2 per cent solution of silver nitrate, thus obtaining momentary sterilization of the area. It is thus made evident that the dangers of infecting a normal kidney, if not absolutely nil, are at least reduced to the minimum, when operating with the direct vision cystoscope.

2. **To Estimate the Renal Function When the Separator Can Not Be Used.**—The use of the separator is sometimes impossible; for instance, in the presence of anatomic anomalies, such as the two cases that I have observed, in which the inferior wall of the bladder was destroyed by vesicovaginal fistulæ. This is also true in advanced pregnancy, or in cancer, or fibroma of the uterus, etc. Likewise in cystitis which is so pronounced that the extremely sensitive bladder contracts violently and prevents the regular application of the instrument.

In these cases ureteral catheterization should be performed only with the direct vision cystoscope. First, because the vesical capacity is very small; and second, because the difficulty of obtaining the required transparent bladder medium makes indirect cystoscopy almost impossible.

What a difference there is in operating with the indirect cystoscope, when pus and blood constantly obstruct the visual field, and on the other hand, with direct cystoscopy, with which, after tamponing, the operation is performed on a dry, clear mucosa, upon which one can work with security, with system and with success!

In a particularly difficult case, I obtained a splendid result. In the service of Souligoux, at Tenon Hospital, I saw a young woman, aged twenty-four years, who had a large tumor on the right side and seemed to be suffering pain on the left side. The urine was extremely bloody, the vesical capacity was 100 c. c., and it was almost impossible to obtain a transparent medium. Notwithstanding these difficulties, on November 8, 1907, I was enabled to catheterize the left ureter, the only one visible, in the presence of Lagane, intern of the hospital.

Gauthier, of Lyons, was also able to locate and catheterize one ureter in a tuberculous bladder which was completely ulcerated and bleeding on the slightest contact, and with a capacity of 40 c.c. In another case Gauthier found it possible, with my direct cystoscope, to catheterize a ureter the orifice of which had prolapsed and taken the shape of a cornucopia. In his own words: "It can be said without exaggeration, that these two patients owe their lives to the direct vision cystoscope."

3. Apart from these striking cases, it seems that the direct vision cystoscope, generally speaking, is by far preferable in women, to the indirect cystoscope. The direct introduction of a catheter into a female ureter is the simplest and easiest matter; it takes but a few seconds. Double catheterization of the ureters is also much easier with the direct than with the indirect method.

Quoting Ferron: "Even the manipulation of the catheters is simplified; changing the catheters so as to find one that will enter the ureteral orifice, is much more rapidly accomplished than it can be done with the indirect cystoscope. Another real advantage is the diversity of form of the catheters that may be used. With the indirect method only cylindrical catheters are employed. Lavage of the pelvis, for instance, is greatly facilitated by the use of catheters having a funnel-shaped end. The tip of the syringe adapts itself to the funnel-shaped end hermetically. The quantity of fluid injected and consequently the pelvic capacity, can be exactly determined with cylindrical catheters;

this estimation becomes a much more delicate matter. Eynard's conical catheters, the distal caliber of which measures 12, 13, 14 Charrière, have given us excellent service."

4. With direct vision cystoscopy, catheters of relatively large caliber up to No. 15 Charrière, can be inserted as far as the kidney. Their large wide funnel can not pass through the narrow canal of the indirect cystoscope, an advantage which facilitates copious lavage by permitting the use of a large syringe.

5. In a normal bladder and under normal circumstances, a catheter manipulated through the indirect cystoscope may not be able to enter the ureteral orifice because it impinges on the wall or slides over it. Nitze himself showed me an instance of this kind in Berlin. In these cases, on the other hand, direct vision cystoscopy rarely fails. Indeed, the catheter, which is kept rigid by the stylet can penetrate the ureteral orifice much more readily than with the indirect cystoscope.

All that is required is to isolate the orifice within the lumen of the cystoscopic tube, and perhaps to press the border of the tube against the ureteral orifice; thus the ureteral meatus will protrude into the tube and however small it may be, a catheter will usually penetrate into the ureter.

I employed this procedure on November 7, 1907, at Saint Louis Hospital, in the service of Beurnier, in a woman with symptoms of hydronephrosis, with a very small ureteral orifice. By the aid of this method, catheterization was easily accomplished.

6. In inflamed and hemorrhagic bladders ureteral catheterization with the direct vision cystoscope should be preferred. Jean Ferron has emphasized this point very strongly in an interesting study[1] on ureteral catheterization by direct vision cystoscopy. He says:

"When the bladder does not tolerate the necessary 80 c.c. of fluid for indirect cystoscopy, some authors, hardly mentioning Luys' tube, frequently advise surgical intervention. That is, exclusion of the diseased kidney, lumbotomy, nephrotomy, ureterostomy. This method of procedure is suggested in some of the most recent publications. Just a few lines are devoted to the suggestion that direct vision cystoscopy is indicated when 'cystoscopic catheterization is rendered impossible by the unfavorable condition of the bladder.'

"Nevertheless this method has great advantages. The fact that it has been neglected seems to us unjust for more than one reason. * * *

"In numerous instances of intolerant bladder, with a capacity less than 80 c.c. thus rendering cystoscopic examination impossible, we have been able to catheterize successfully with Luys' cystoscope. A detailed description of these cases need not be given here; suffice it to say they

were observed by Pousson and his students. We shall relate the history of one very interesting case:

"L., aged thirty-five years, postal clerk, consulted me in February, 1912, for pollakiuria and hematuria. A brother and sister had died of tuberculosis.

"In 1902, while a sergeant major of chasseurs, in previous good health and without genital disease, he suddenly developed a right orchiepididymitis, following a trauma. This lesion increased gradually, and in 1903, one year later, he noticed a painless induration of the *left* epididymis. Discharged from service, he went home and for a long time did not show any symptoms other than the abnormal size of his epididymes. In December, 1910, after a bicycle ride he noticed his shirt was blood-stained. In September, 1911, his urine was cloudy, he micturated once during the night and the urine left a deposit in the glass. Urinary frequency increased. Separation of the urine made by a specialist showed bloody urine from the left side and nothing whatever from the right side. According to the patient's statement the right catheter was found clogged by a blood clot when it was withdrawn and examined. The physician made no attempt to interpret the result of the test. The pollakiuria increased to such an extent that the urine was voided almost continuously; in this condition he was referred to us.

"General condition is fair. A superficial examination does not reveal anything but two enormous epididymes. The renal regions are not painful; pressure on the hypogastrium is slightly painful. Palpation of the ureteral points and Pasteau's points is negative. The urethra is free and painless; the prostate is large and uneven; urine very bloody. In spite of a previous injection of stovaine, it is impossible to introduce into the bladder more than 20 to 25 c.c. of fluid. Indirect cystoscopy had to be given up.

"Luys' tube passed easily. We found ourselves in the presence of a rare form of cystitis. The vesical cavity is occupied by a gray, fringed, denticulated false membrane, resembling felt, which covers the entire mucosa. A ureteral ejaculation indicated the site of the left ureteral orifice, and a No. 8 catheter was introduced as far as the renal pelvis. Analysis of the separate urines collected during three and a half hours (Labat) is as follows:

	LEFT KIDNEY	BLADDER
Quantity	23.5 c.c. { 4 c.c. / 12 c.c. / 11.5 c.c.	12.5 c.c. { 6.5 c.c. / 3 c.c. / 3 c.c.
Urea per 1,000 c.c.	7.60 – 23.60 gm.	22.10 – 12.60 gm.
Urea completely eliminated	0.706 gm.	0.219 gm.
Chloride of sodium per 1,000 c.c.	6.40 – 8.40 gm.	8.90 – 7.90 gm.
Chloride of sodium completely eliminated	0.220 gm.	0.205 gm.
Albumin	8. – 4. gm.	9. – 9. gm.
Blood	All over the field. Many blood elements, leucocytes predominating. No microbes.	All over the field. Blood elements, leucocytes predominating. Few casts and many bacilli.

"Two days later, the right ureter was catheterized. The catheter was arrested at a point 12 centimeters from the orifice and only a few drops of bloody urine were recovered. Another catheterization of the same side gave the same result. So then, all of these examinations showed a diseased condition of the right kidney, although the microscope did not reveal any tubercle bacilli. The results previously obtained by the urinary separation were thus confirmed. At that time, the secretion of the right kidney had already become considerably diminished.

"Nephrectomy suggested itself at once. Before operating, however, we attempted to clear the bladder of the gray fringed pseudomembranes which covered it. This was accomplished in several sittings by direct cystoscopy using a forceps devised for endovesical manipulations. During this period the patient for the first time expelled a considerable quantity of false membrane between the sittings. These membranes contained very dense groups of Koch bacilli. This fact was all the more interesting because the microscopic examinations were negative and guinea pig inoculation of the separated urines also proved to be negative.

"On March 22, 1912, when the bladder had been cleared of all the false membranes, a lumbar nephrectomy was performed and followed by a right epididymectomy. The renal parenchyma was almost completely destroyed and presented large cavities which communicated with the pelvis; the latter with very thick walls, was continuous with a ureter which was considerably narrowed at certain points. The postoperative history was uneventful. The patient left the hospital on the twenty-seventh day, fully recovered. He has remained under treatment since then for his vesical lesions.

"In this case, distention of the bladder being absolutely impossible, Luys' cystoscope helped us to make the diagnosis of the diseased side and assured the integrity of the opposite organ. This was done without having recourse to complicated operative measures usual in such cases. Thanks to direct cystoscopy, we found and treated a rare form of tuberculous cystitis, successfully catheterized both ureters and determined the proper treatment to be adopted.

"In conclusion, we do not pretend that Luys' instrument and the indirect cystoscope are rivals. We do not purpose to minimize the innumerable services rendered by the Albarran deflector. We have tried to show, however, that in addition to the classic method, universally used, there exists a method of catheterization that is not sufficiently well known. One of its great advantages is a much more thorough asepsis. In an inflamed bladder where a kidney infection is to be feared, the metallic tube (Luys) is to be preferred because it is more truly surgical in its simplicity. Its employment is far more practicable in women, because of the facility of manipulation, and the advantage of a quick change of the catheters, when it is desired. We do not hesitate to repeat Luys' assertion that direct vision cystoscopy is the method of choice in the female.

"Its advantages are perhaps not so striking in the male. Nevertheless we have used it for many months without occasion for regret. A urethra with a caliber less than normal, or an extremely obese patient, were the only obstacles to this method of examination.

"Lastly, we repeat that in difficult cases in which the indirect cystoscope has failed, before resorting to bloody operations, direct vision cystoscopy should be attempted, but only by a surgeon who has had experience with Luys' tube. In many instances it will give him important information, without subjecting the patient to the slightest risk."

7. In a bladder with trabeculations or with diverticuli, the search for the ureteral orifice is often extremely simplified by the direct cystoscope. Ferron reports[2] the following interesting case apropos:

"In a female patient in the service of Pousson, we searched in vain for the left ureteral orifice at its normal site and all around it; suddenly, thrusting the extremity of the tube into a very narrow diverticulum, we saw the ureteral orifice and catheterized it easily."

It can be readily seen that if the indirect cystoscope had been used in this case, the diverticulum in which the ureteral orifice was found, would have remained in the dark, undiscovered. The superiority of the direct vision cystoscope is thus very evident.

8. A final advantage of direct catheterization is found in the fact that we can better see and demonstrate to assistants that the catheter has really entered the ureter and has not merely slipped along the surface of the mucosa. Indeed, by manipulating the tube properly, the entire circumference of the catheter can be seen; we can also determine that it is completely surrounded by mucosa and that it stands out prominently in the bladder, like a flagstaff dug into the ground.

Indications for Indirect Cystoscopy in Ureteral Catheterization

There are two principal indications for the employment of the indirect cystoscope in ureteral catheterization: 1. In obese and asthmatic *(congestif)* males. In these patients the inclined position is not easily maintained, and again, the bladder does not distend itself well on account of the abdominal plethora. In stout females with marked genital prolapse, distention of the bladder in the inclined position is likewise impossible. It is preferable to use the indirect cystoscope in these casse. 2. In males, with the urethral meatus or the urethra itself of a relatively small caliber, which does not admit the tube of the direct vision cystoscope.

Subsequent Steps in Ureteral Catheterization

As soon as the catheter is properly placed and the cystoscope removed, a recipient (sterile test tube) is placed immediately underneath so as to collect every drop of fluid; not a single drop of fluid should be lost, because the ureteral catheter may have drained a renal retention cavity, the presence of which and the measurement of its capacity are always important to know.

When everything has progressed well, some time is allowed to pass in order to collect a sufficient quantity of urine; and when this has been done, the catheter may be removed. But in the meantime it is highly important to profit by the presence of the catheter to determine the pelvic capacity; apart from the important information which

can thus be gained, the antiseptic solutions, like the 1:1000 silver nitrate, for example, have the great value of clearing the pelvis and ureter of all the possible contaminations brought in by the tip of the catheter. If this is done, accidents due to the catheterization are very rarely seen.

The patient should take certain precautions after catheterization. Immediately thereafter, he should go to bed for twenty-four hours and drink water copiously. He should take two grams of urotropin in twenty-four hours. With these indispensable precautions, ureteral catheterization can be accomplished without any risk of injury to the patient.

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DIFFICULTIES, ACCIDENTS, AND ERRORS IN URETERAL CATHETERIZATION

Ureteral catheterization can be rendered impossible by many circumstances, the principal being the following:

1. **Difficulties Inherent in Indirect Cystoscopy.**—These have already been studied (see page 189) and will be merely enumerated at this time, as follows: narrow meatus, urethral stricture, spasm of the membranous urethra, hypertrophy of the prostate, cystitis, very small vesical capacity, etc.

2. **Impossibility of Locating the Ureteral Meatus.**—Unfortunately there are numerous conditions in which the ureteral orifice is practically invisible. In pronounced cystitis, with edema and inflammation of the vesical mucosa, the ureteral orifice may be completely hidden among the edematous masses, thus rendering its discovery almost impossible. On the other hand, in prostatics, the orifice is displaced, even hidden behind the prostatic swelling. In changes affecting surrounding organs, e.g., uterine cancer, fibroma, pregnancy, it may be very difficult to find the ureteral orifice and sometimes even impossible to see it at all.

3. **The Ureteral Orifice May Be Small.**—In the same manner that a urethral meatus is sometimes too small for the introduction of a sound, the ureteral meatus is likewise occasionally so small that the finest ureteral catheter can not be introduced. When, however, the lips of the ureteral meatus are narrowed congenitally, and not through inflammation, they can be treated in the same manner as the urethral orifice. First we attempt to introduce a small No. 5 catheter with an olivary tip; this is followed by a No. 6 catheter which is forced gently

into the ureteral orifice. In these cases, it is always best to use catheters with an olivary tip.

4. **Inflammation of the Ureteral Orifice.**—This is very often due to a pathologic change in the corresponding kidney and to a pyonephrosis. It may very often prevent the introduction of a catheter because ulcerations are found around the ureteral orifice which bleed by the contact with or passage of the catheter.

5. **The Arrest of the Catheter a Few Centimeters from the Meatus.**—This obstruction is relatively frequent and takes place about two to four centimeters from the meatus. There are various causes. In the first place the ureter is narrowest at this point; secondly, the ureter bends across the bifurcation of the pelvic blood vessels at this point at the level of the promontory.

In the presence of these difficulties, certain expedients must be resorted to; one of the most useful is to vary the flexion of the thighs over the pelvis, thus increasing or diminishing the amount of flexion. In this way, the introduction of the ureteral catheter can be facilitated.

6. **The Ureteral Catheter Does not Drain.**—Unfortunately, this is not a rare occurrence and may be due to several causes; one of the principal causes being that the extremity of the catheter is in a faulty position, having been introduced too far into the renal pelvis. In such circumstances it is advisable to withdraw the catheter slowly for about two or three centimeters, and the flow will be reestablished.

Occasionally in spite of this procedure, the catheter still does not drain. We must then exercise patience and wait ten or fifteen minutes. At the end of that time droplets of pus or tiny blood clots are seen emerging from the catheter, thus explaining the cause of the previous failure of drainage.

In still other cases, in spite of all one's patience, the urine persists in refusing to flow. An attempt should be made to clear the catheter of possible obstructions, by injecting a small quantity of fluid into its interior. This expedient should be utilized only as a last resort, because the chemical analysis of the urine will be changed as a result of the fluid injected. The urinary secretion is thus diluted with a quantity of water which it is very difficult to estimate properly.

7. **The Catheter Drains Too Much.**—This is not properly speaking a serious disadvantage, but it is well to know how to interpret this polyuria properly. It may be due simply to the evacuation of a hydronephrosis; the exact quantity of the flow should be measured and recorded.

It may also be due to the renal irritation produced by the introduction of the catheter. A very simple method of differentiating these

conditions and thus making a correct diagnosis, is to study the character of the flow; when the evacuation takes the form of a jet, or is a continuous flow without intermission, it is more than probable that we are dealing with the evacuation of a hydronephrosis. When, to the contrary, the ureteral ejaculations are decidedly rhythmic, with intervals during which urine does not flow, a physiologic excitation of the kidney must be the cause.

8. **The Flow Is Blood Stained.**—This is also a relatively frequent occurrence in catheterization. It may be said to be constant, because microscopic examination of catheterized urine invariably reveals some blood cells. Their presence is easily explained; the catheter in passing through the ureteral interior necessarily injures the ureteral mucosa to some degree and thus usually produces a slight hemorrhage. This may be negligible or simply microscopic; on the other hand, it may be much more important especially when the kidneys do not functionate steadily and when the renal pelvis is not properly cleansed by a sufficient quantity of urine.

Accidents Associated With Ureteral Catheterization

The accidents which may occur in connection with ureteral catheterization are either mechanical or infectious in character.

Mechanical accidents are relatively very rare. Perforation of the ureter has been reported, but this is an extremely unusual occurrence. Infectious accidents are more serious and more frequent.

Infection of a Healthy Kidney by the Ureteral Catheter.—A ureteral catheter introduced through the indirect cystoscope in an infected bladder filled with fluid may carry pathogenic germs into the renal pelvis and thus bring about an infection in a previously healthy kidney.

This is an undeniable and undoubted fact, and it has been observed by numerous authors. This accident may result in spite of copious and repeated irrigation of the bladder. It is a fact well known to all who practice indirect cystoscopy, that even after the bladder has been thoroughly irrigated and the fluid comes out perfectly clear, the vesical mucosa is not absolutely clean. This is made evident by the numerous impurities that can be seen floating in the fluid through the lenses of the cystoscope. The catheter coming in contact with this fluid, becomes infected not only on its external surface, but likewise in its interior, which is far more serious. In this way the catheter, soiled with impurities "intus et extra," becomes a perfect carrier of microbic elements which can and may infect the pelvis and the kidney.

This is fully confirmed in a report of a typical case by Rafin, of Lyons,[1] who found that *spermatozoids were evacuated through a*

catheter inserted in a ureter! "In a patient who had to be anesthetized because of the limited capacity of the bladder, I found spermatozoids in the urine evacuated through the ureteral catheter, although a thorough washing of the bladder was previously effected. It is probable that the patient emptied his seminal vesicles during the struggle in the early stage of the anesthesia; the sperma were carried into the bladder by the cystoscope and the vesical fluid containing a considerable quantity of spermatozoids in suspension, had thus filled the ureteral catheter with them."

But this is not all: Apart from the fact that the ureteral catheter may become a carrier of microbian elements capable of infecting the pelvis and kidney, in a direct manner, as just mentioned, infection of the kidney may take place indirectly as well. When the catheter passes into the ureter, it forces the ureteral valve,—the "guardian of the ureter;" an ascending infection may be produced as a result of this forcing of the ureteral valve.

In these circumstances, there is a reflux of the infected vesical fluid into the ureter. Marguliès[2] has stated: "We have occasionally noticed the reflux of the boric solution from the bladder into the ureter, and its subsequent elimination through the ureteral catheter. Casper was the first to call attention to this fact; for proof, he injected coloring substances into the bladder and immediately afterward these substances were eliminated through the ureter.

[The editor observed a case but recently which gave the following confirmatory phenomena: The patient was taking methylene blue internally and the urine was colored deep green. A kidney lesion was suspected and the bladder was filled with oxycyanid solution preparatory to cystoscopy (indirect) and catheterization of the ureters. When the catheters were inserted, it was found that the left catheter was draining green urine, and the right was draining white fluid, probably the oxycyanide solution. With both catheters *in situ,* draining colorless and green fluid, respectively, a solution of permanganate of potassium was injected into the bladder through a vesical catheter, and immediately the white fluid emerging from the right ureter was changed to red, whereas the green urine continued to come through the left catheter as before. This proved undeniably that the left catheter was draining the left kidney urine, but that the fluid which came from the right catheter, was merely the bladder fluid which was being "sucked up," so to speak into the ureter by the "reflux," and was passing out through the catheter. On operation it was later found that the right kidney was atrophied and was not functioning at all.—EDITOR.]

Deschamps also said in his monograph;[3] "The experiments of Lewin and Goldschmidt, of Courtade and F. Guyon, have demonstrated

that a reflux of the bladder urine toward the ureter can be produced, but only at certain moments; i.e., when the valvule opens to release the ureteral flow. In the normal state, this reflux, in our opinion, is a negligible cause of ascending infection; but when a ureter has been catheterized, and the valvule has been forced open, it is possible that the reflux takes place much more easily, the barrier does not seal the opening hermetically and the bladder can push its infecting germs toward the ureter."

Israel,[4] in a critical analysis of ureteral catheterization, insists upon the danger of ascending infection. He reports the case of a physician suffering from an old urethritis, with a slight cystitis; Casper catheterized one of his ureters because of a pain in the lumbar region. The urine thus collected by the catheter was clear and the patient was glad to know that his kidney was in normal condition. But on the evening of the same day he was suddenly seized with vomiting, fever, lumbar pains, and chills, and he voided purulent urine. This unfortunate condition lasted a long time and the patient finally died. The following is a complete history of the case, as communicated to me by Israel, October 10, 1908:

Dr. G., physician at Rostow-on-Don, Russia; had gonorrhea at the age of twenty-four (1893). Urine became slightly cloudy. Irrigation of the bladder unsuccessful. In 1897 right ureteral catheterization by Casper: Right kidney urine perfectly clear, no albumin, normal. The following evening chills, vomiting, fever, which lasted two or three weeks. Urine became cloudy immediately after catheterization. During the two years following, there were occasional attacks of chills, vomiting, and fever, lasting one or two days; pain in right kidney region for several months past; cloudy polyuria.

From that time on, the patient always suffered pain, the febrile attacks recurring at irregular intervals. He became gradually pale and weaker. On February 6, 1906, he came to my clinic, pale and weak, without appetite, tongue dry, continuous headache, and cloudy polyuria. Nine days later, he died in uremic coma.

At the same time Israel sent me the histories of two additional cases in which renal infection resulted from ureteral catheterization. The following are these histories as written by the author himself:

Case 1.—Mlle. Melanie C., aged thirty-four years. Right intermittent hydronephrosis; nephroptosis. Normal urine. From time to time, attacks of colic lasting two or three hours. After and between these attacks she felt perfectly well. On July 16, 1900, right ureteral catheterization; the instrument is arrested just above the vesical orifice of the ureter. July 21, ureteral catheterization is repeated with the same result; July 22, patient quit the hospital. She came back on August 10 to be operated upon. Since she left the hospital, she complains of nausea, vomiting, and frequent palpation of the heart. Urination, previously normal, is now increased in frequency to twelve times in twenty-four hours; pain in the bladder and urethra after micturition. The right kidney more enlarged than in July, and is the seat of continuous pain; colic from time to time. Palpation of the right kidney is painful.

The urine is cloudy and contains many leucocytes, a few erythrocytes and many hyalin and granular casts. Evening temperature 39.4° C. Vomiting; oliguria.

August 20, right nephrectomy. A large cavity filled with pus; an abscess the size

of a walnut and several small ones in the cortical substance. The mucosa of the pelvis and calices is red, ecchymotic, thickened.

CASE 2.—Bessie C., aged twelve years, of London. Grandfather and two uncles died of tuberculosis. For the last five years, weak, without appetite; pollakiuria, enuresis. Five months later Koch bacillus found in the urine. She improved slowly. Three years ago, she complained of slight pains in the right kidney. At present she feels well, urination every two and a half or three hours. No pain on urination, no pain in the kidney. Temperature normal; she never had fever. Urine pale, hazy; specific gravity, 1,004; albumin 0.25 per 1,000 c.c. Many leucocytes; two or three hyalin casts; numerous Koch bacilli.

June 27, cystoscopy under anesthesia: Mucosa inflamed, covered with fibrinopurulent membranes; the process is more marked on the right side than on the left; catheterization of the left ureter; catheter in the bladder. Urinalysis:

RIGHT KIDNEY	LEFT KIDNEY (BLADDER)
Urine pale, cloudy	Urine pale, cloudy
Specific gravity 1,009	
Albumin 0.33 per 1,000 c.c.	1.65 per 1,000 c.c.
Many leucocytes	Many leucocytes
Urea 1.4 per 1,000 c.c.	3.6 per 1,000 c.c.
Freezing point –0.60°	–0.52°
Few Koch bacilli	Many Koch bacilli

TEMPERATURE

Date	Morning	Evening
June 28,		38.6° C.
" 29,	38.° C.	40.3
" 30,	37.6	38.8
July 1,	39.5	39.2
" 2,	39.6	39.8
" 3,	38.2	39.1
" 4,	37.8	37.9
" 5,	37.4	37.5
" 6,	36.8	37.4
" 7,	37.8	38.8
" 8,	39.2	39.2
" 9,	38.4	38.2

June 28, nausea, very frequent vomiting.
" 29, pain in both kidneys
" 30, urine very purulent
July 1, tenesmus every ten minutes
" 2, tenesmus day and night, very painful
" 3, vomiting
" 4, much vomiting; oliguria
" 5, extreme nervous agitation, legs and hands cold
" 6, vomiting of black masses
" 7, vomiting of black masses
" 8, quantity of urine increased
" 9, convulsions in left arm
Coma.

This author also reports a case of renal abscess which he attributes to ureteral catheterization performed a few weeks previous to a nephrectomy done for a neoplastic kidney (Deschamps).

Hartmann also says:[5] "I have seen a patient who presented symptoms of right pyelonephritis for a long time, and who showed symptoms of left pyelonephritis for the first time a few weeks after a ureteral catheterization performed by one of my colleagues. These infections are perhaps more frequent than it is thought, because they manifest themselves only a certain time after the catheterization."

At Johns Hopkins Hospital, Sampson[6] had a fatality resulting from an ascending ureteral infection; this was caused by a catheter left *in situ* as a guide during hysterectomy for a cancer of the uterus.

The dangers of a catheter left *in situ* may be seen in the following history of a characteristic case reported by Legueu:[7] "This (the ureteral catheter *à demeure)* carries the risk of causing almost certain infection of the cavity. I employed it in a patient with an enormous left hydronephrosis; catheterization was easy, although the operation, which was performed later, showed a pronounced stricture; and I evacuated nearly three and one-third liters of urine through the catheter.

"Having repeated this evacuation several times, I wanted to introduce a catheter *à demeure* to permit the cavity to contract. But within three days, the urine became cloudy, the temperature rose, and I was compelled to abandon catheterization and perform ureteropyelotomy as quickly as possible. The operation was done transperitoneally. The infection of the cavity spread to the opened serous membrane and the patient died of peritonitis in a few days."

Tuffier[8] expresses the same opinion: "I was consulted by a woman from Geneva. She had been treated for a long time in Paris, for a double pyelitis. According to her statement, ureteral catheterization performed for diagnostic purposes had greatly aggravated her condition. I know of another patient, from the environs of Lille, who died fifteen days after a diagnostic ureteral catheterization."

Desnos likewise had to remove a kidney infected with tubercle bacilli, carried by the ureteral catheter, when passed through the prostatic region in the course of a suppurative prostatitis.

Concerning this grave danger of infection, the answer has been made, that ureteral catheterization should be performed only on a kidney supposed to be diseased and already infected; in the meantime the urine excreted by the opposite kidney directly through the ureter is collected by a catheter in the bladder. But the clinical findings (we have ample proof in several cases) are sometimes absolutely wrong, and ureteral catheterization of a healthy kidney might be performed on their data alone, thus submitting the patient to the risk of an infection, as we have shown. In point of fact, ureteral catheterization with

the direct vision cystoscope seems to be the most desirable method of preventing the infection of a healthy kidney via the ureteral catheter.

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Errors Associated With Ureteral Catheterization

Inaccuracy is an important factor in the errors associated with ureteral catheterization. There are five principal sources of error:

1. It is impossible to be certain that the caliber of the ureteral catheter will adapt itself tightly to that of the ureter. Consequently some urine might dribble down between the walls of the catheter and the ureteral wall, and thus get mixed with the urine of the opposite kidney which flows directly into the bladder, and thereby falsify the results.

This flow of a certain quantity of urine between the catheter and the ureteral wall, is indeed undeniable, and I have observed it frequently during lavage of the pelvis carried out for therapeutic purposes. In point of fact, the silver nitrate used for irrigation of the pelvis very often drained into the bladder, where it could easily be detected on collecting the vesical contents with a catheter at the termination of the lavage. This vesical fluid usually showed an abundant precipitate of characteristic silver chloride; this clearly proved that the silver nitrate solution which had been used for lavage of the kidney had trickled into the bladder between the catheter and the ureteral wall.

The best proof of the fact that the urine often drains down between the catheter and the ureteral wall, is obtained by catheterization of both ureters and leaving the catheters *à demeure* for some time. Clear urine may issue out of each kidney through its respective catheter; at the same time, a certain quantity of urine is often found in the bladder, which can be withdrawn by the introduction of a Nélaton catheter into the bladder. This affords certain proof of the leakage of urine between one of the two catheters and its ureteral wall.

This source of error in ureteral catheterization has also been recorded by Kouznetzky, of Petrograd.[1] In order to prevent this occurrence, he catheterizes both ureters and then empties the bladder; after the examination, before removing the ureteral catheters, he again empties the bladder of its contents. This will establish the quantity of the urinary leakage into the bladder. In only twelve out of twenty-two cases was he able to prevent its occurrence. In one case, a woman, in spite of three distinct attempts and the use of a No. 8 catheter, he was unable to prevent this leakage. In two cases, the urinary leakage amounted to 194 and 148 c.c. respectively, for a period of two hours.

A very characteristic case apropos of this subject was referred to me in the service of Rochard, at Saint Louis Hospital, on October 14, 1907. It was the case of a young woman with a very large and adherent tumor in the right hypochondrium; she also had pyuria. By request, I catheterized both ureters with the direct cystoscope, with the following result: On the left side, abundant urine, but distinctly bloody; on the right side, not a drop of fluid. After waiting half an hour, a catheter was introduced into the bladder, which gave forth about twenty c.c. of cloudy, bloody urine. Both ureteral catheters were positively in the ureters, because their presence was verified by all the assistants present. We were undoubtedly dealing with a distinct leakage between the catheter and the ureter.

In another case, equally clear, I observed the trickling of urine between catheter and ureter. A woman, Mme. L. J., aged 37 years, entered the service of Demoulin, at the Saint Louis Hospital, on October 2, 1907. In the right hypochondrium she presented a large mass in which distinct fluctuation could be felt; the urine was purulent. By request, I examined her under chloroform, on November 12, with my direct cystoscope. Although the capacity of the bladder was only about 40 c.c., I found the following: On the right side, an enlarged ureter, which emitted abundant purulent ejaculations with white, thick creamy pus. I catheterized this ureter with a No. 7 catheter, which penetrated easily about 10 c.m., but was arrested at that point.

This catheter was withdrawn, and the left ureteral orifice inspected. At first, it was hidden by false membranes, but it was soon discovered. The bladder was cleaned and dried with small swabs, and a No. 6 catheter easily introduced into the left ureter and left there for three quarters of an hour. During this time a Nélaton catheter was left in the bladder to collect the urine from the right kidney. At the end of the period, the separate urines from the ureteral catheter and the bladder catheter amounted to practically the same quantity. Analysis made by the pharmacist of the service showed: Left kidney (through

PLATE XIX

FIG. 1.—*Cancerous tumors of the bladder.* In this case, the entire vesical wall was invaded by a neoplastic deposit, similar to that represented on the vesical floor.

PLATE XIX

ureteral catheter): Urea, 19 grams per liter, and chlorides, 4.90 grams per liter. Right kidney (through vesical catheter): Urea, 12 grams per liter, and chlorides, 6.55 grams per liter.

On November 15, with the assistance of Demoulin, I nephrectomized the right kidney; I found it reduced to a flabby shell in which not a trace of parenchyma could be detected. Undoubtedly, the result furnished by the vesical catheter while the left ureter was being catheterized, was erroneous. The urine of the left kidney had drained between the ureter and the catheter and had trickled into the bladder. Both urines in spite of the difference in their chemical composition, had really been derived from the left kidney alone.

During the operation, I was also easily enabled to determine the cause of the ureteral obliteration. This was due to a kink of the ureter in the shape of an S, the result of a periureteritis. A catheter introduced through the renal end of the ureter was distinctly arrested and could not be advanced.

Cathelin[2] reported an unfortunate error which resulted from ureteral catheterization, and which culminated in the death of the patient. A man, aged fifty-seven years, complained only of pain in the right kidney; he never had any pus, blood, or gravel in the urine.

Cystoscopy and ureteral catheterization gave these results:

	RIGHT KIDNEY (CATHETERIZED)	LEFT KIDNEY (BLADDER URINE)
Quantity	15 c.c.	10 c.c.
Urea (per liter)	13.45 gm.	13.24 gm.
Chlorides (per liter)	10.50 "	9.50 "
Deposit	Numerous broken down blood cells.	Numerous blood cells, few renal cells.

"Relying," says Cathelin, "on the excellence of the urine recovered through the vesical catheter, and fearing that the patient would not derive any benefit from a simple exploratory operation, we decided upon a nephrectomy.

"Subsequent History: The first day, 150 c.c. of urine were recovered from the bladder; the second day, 50 c.c.; after that, nothing, in spite of the administration of lactose and theobromine. The fourth day, in view of this persistent anuria, we decided to do a nephrostomy of the left kidney. This operation showed the total absence of the kidney on that side. The patient died on the seventh day, and the autopsy confirmed the operation findings. There was neither kidney nor ureter on the left side."

Nicolich has reported a case in which an error was made as a result of ureteral catheterization and confirmed by autopsy: "A woman,

complained for a long time of purulent urine, and frequent and painful urination. The right kidney was palpable and a little painful; the left kidney was not palpable. Downes' instrument was used and left in place for half an hour; the right tube then gave purulent urine, while not a drop of urine could be obtained from the opposite side. Catheterization of the right ureter showed a retention of pus in the right kidney; the catheter was left *in situ* for twelve hours, with this result: Urine from the catheter, quantity, 400 c.c. cloudy, purulent; urine from the bladder, quantity, 180 c.c., cloudy, purulent, bloody. This result might have been interpreted to mean that the left kidney although more diseased than the right, was actually functionating, although as a matter of fact, it did not functionate at all, because it was found to be completely atrophied."

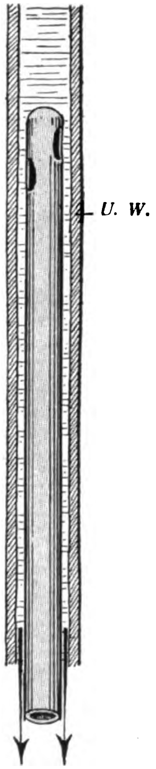

Fig. 192.—Ureteral catheter within a ureter. One can easily see how the urine trickles down between the catheter and the ureteral wall, *u.w.*

These observations indicate what might happen when the caliber of the ureteral catheter is smaller than that of the ureter itself. When catheterization of both ureters is performed with the indirect cystoscope, only small catheters can be used, and if catheterization is continued for several hours, the urine will continually trickle down between the catheter and the ureteral wall, so that it will be impossible to estimate exactly the quantity of urine furnished by each kidney. On the other hand, if a larger catheter is used, and the ureter is too narrow to accept it, the ureter will bleed.

The answer to this criticism was given at the Madrid Congress.[3] Nitze at that gathering, presented new ureteral catheters provided with double canalization (Fig. 193), one for the flow of urine, and the other for the injection of water into a small rubber bulb, which when filled with water, comes into firm contact with the ureteral walls. But this modification acts as a detriment to the interior caliber of the catheter, for the latter thus becomes too narrow for the free passage of slightly thickened pus or small blood clots.

Various methods have been suggested by other authors:

Edgar Garceau, of Boston, devised a new catheter for the female, which can be introduced with the aid of my direct cystoscope. This catheter is 35 cm. in length, its caliber is No. 13 Charrière, from the external end to its center, and from this point on the diameter becomes smaller gradually and progressively up to the ureteral end, where its diameter is No. 6 Charrière.

The ureteral tip of the catheter is like that of a flute; at each side of the instrument somewhat removed from the extremity, there are two eyes opposite one another to facilitate the urinary flow. Its introduction is extremely simple. First a stylet is inserted into the ureter through Luys' cystoscope and the catheter is then advanced over the stylet; inserting it into the ureter is an easy matter because these maneuvers are carried out under direct control of the eye.

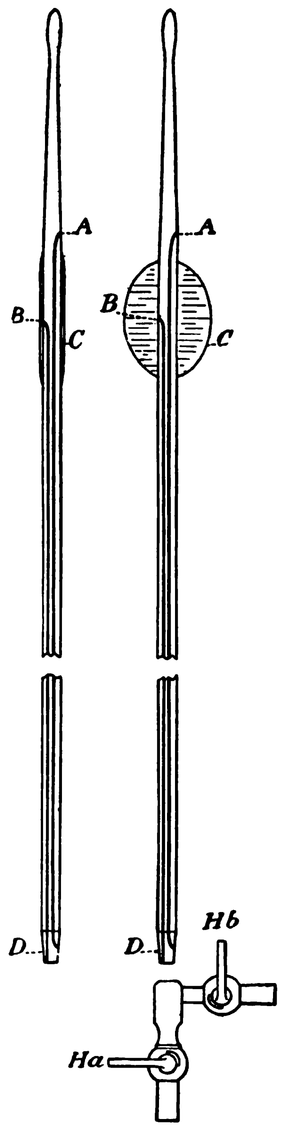

Fig. 193.—Ni ze's ureteral catheters with double canals, to prevent the urine from trickling down between the catheter and the ureter, by filling a rubber bulb with water, thus bringing it in close apposition with the ureteral wall.

The advantages of this instrument are, first, the certainty that the total quantity of urine secreted will be collected, because the catheter obstructs the ureteral canal in exactly the same manner as a stopper corks the neck of a bottle. Secondly, the facility with which it can be introduced; this is owing to the fact that the ureteral extremity has a much smaller caliber than that of the ureter itself.

Gudin, of Rio de Janeiro[5] has adopted still another procedure, in order to obtain occlusion of the ureteral orifices. He accomplishes ureteral catheterization with a conductor, this being a modification of the ureteral catheter and stylet previously described by Albarran.[6] Using an indirect vision cystoscope, Gudin first introduces graduated whalebone stylets No. 4 Charrière, and 90 cm. in length, the extremity of which is made of rubber, so as not to injure the ureteral mucosa and possibly cause a false passage. Each stylet is introduced into the ureter for a distance of about 15 cm.; then the indirect cystoscope is removed. The stylets are now left in place, and catheters with blunt ends are passed over them into the ureter. The catheter is passed over the stylet, the precaution being taken not to exert traction on the latter, for that might cause it to drop into the bladder; then holding the end of the stylet with one hand, the catheter is advanced over it with the other hand. Finally the stylet is removed.

The ureteral catheters have a caliber of 5 to 8 Charrière for a distance of a few centi-

meters; then they dilate progressively up to No. 10 or thereabouts. They maintain this diameter up to the funnel end. The total catheter length is about 45 centimeters. In this manner it is possible to collect, to a certainty, the total quantity of urine eliminated by each kidney.

2. A second source of error is found as a result of the passage of the catheter into the ureter. Without mentioning the lesion that it may produce in tuberculous ureteritis, for instance, a catheter may cause bleeding of the ureter and thus simulate a hematuria, that does not really exist.

On June 8, 1904, J. W. Keefe, replying to Kelly's paper at the meeting of the American Urological Association, reported seventy cases of ureteral catheterization. In forty-two cases he examined the urine before the introduction of the catheter, in order to determine the extent of the damage caused by the passage of the catheter. There was no damage in but three of the cases. In the other cases, traces of blood and albumin were found; part of the blood was due to the distention of the ureter. In thirteen cases hyalin casts were found; nevertheless in only one case, were hyalin casts found before the passage of the catheter. He considers the introduction of the catheter a dangerous procedure, even when the catheter is perfectly aseptic.

3. The third source of error arises from the fact that although catheterization is usually limited to the diseased kidney, the urine must be likewise collected from the supposedly healthy kidney via the bladder. The urine of the kidney thought to be normal, comes into the bladder which is often infected, and it is there mixed with the pus contained in the bladder; in such circumstances it is impossible to say whether the pathologic elements found in the urine are derived from the bladder or from the supposedly healthy kidney.

4. The fourth source of error lies in the fact that we are not absolutely certain that the catheter is resting properly in the ureter, when the indirect cystoscope is employed. In fact, in order to avoid renal infection, some authors recommend the introduction of the catheter into the ureter for a distance of not more than two or three centimeters. Now, if that is done, when the instrument is withdrawn so that the catheter alone remains, the surgeon's eye can no longer see whether the catheter is still in the ureter, or has dropped into the bladder. Keydel, of Dresden, has emphasized this fact[7] and adds that in these conditions one can never be certain that an error has not been committed.

5. The fifth source of error may come from the abnormal irritation of the kidney, due to the mere presence of the catheter within the ureter. The secretion of this kidney may thus be changed, and incor-

rect conclusions arrived at. I have on several occasions observed that upon the introduction of a catheter into the ureter, a very distinct reflex polyuria was immediately produced, which lasted for some time and then slowly disappeared.

This phenomenon was well illustrated and demonstrated by Frank, of Berlin,[8] at the German Surgical Congress, in 1905, in these words:

"I also desire to say, as Israel has already remarked, that very often when a catheter is introduced into the ureter or pelvis, the quantity of urine that flows into the bladder, may be increased or diminished, so that the findings are unreliable. When a catheter is inserted into the ureter or pelvis, the sensitive nerve centers which control the renal secretion are naturally irritated. In this manner, erroneous results concerning the determination of kidney function within a certain fixed period of time are obtained.

"To clear up this question, I have made a series of experiments on certain individuals subjected to identical dietary conditions. First, I catheterized the ureters; a little later, and under the same dietary conditions, I performed separation of the urine (Luys' method). I found that when the ureters were being catheterized, the work performed by the kidneys is much greater than when the urines were separated by the segregator. * * * * * This is strongly confirmed in the four cases which I examined particularly, taking into careful consideration the quantity, the specific gravity, the quantity of sugar after injection with phloridzin, and the variations of urea. These experiments were made in individuals whose kidneys did not present any pathologic conditions.

"In one case, ureteral catheterization as opposed to the separator, caused a spasm of the kidney; in the other case, it provoked a profuse polyuria.

"In these cases, I employed Luys' separator exclusively, this being the only one among the various instruments proposed, which I consider practical."

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URETERAL CATHETERIZATION IN CHILDREN

This can be effected by using indirect cystoscopes of a smaller size, but the visual field will be considerably reduced necessarily. For this reason, it is advantageous to use the direct vision cystoscope.

Rocher and Ferron[1] have emphasized this fact in an interesting article: "Direct vision cystoscopy is always possible, even easy, in girls over five years of age. The urethra readily admits a No. 40 tube, 7 cm. in length, and although the visual field is reduced, the short length of the tube makes exploration of the bladder possible. In a tolerant bladder, a slight Trendelenburg position is sufficient to produce vesical distention. At this early age, this modified position is readily accepted.

"In young girls, the bladder does not differ from that of the mature woman. Although the interureteral ligament may not be so marked, we have, nevertheless, seen it quite distinctly.

"The ureteral orifice usually admits a No. 6 or 7 catheter. In one of our patients, neither orifice admitted anything but a very fine bougie. We believe that this condition has no connection with the age of the patient, since we meet it in the adult, as well, and every specialist has noticed it in some of his cases.

"We have frequently employed general anesthesia, not because these maneuvers are painful, but because children are often frightened on seeing our instruments, and thus become unmanageable."

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CHAPTER VIII

INFORMATION DERIVED THROUGH URETERAL CATHETERIZATION

INDICATIONS FOR URETERAL CATHETERIZATION

Catheterization of the ureters should be reserved exclusively for exploration of the ureter and the renal pelvis. For a complete consideration of ureteral catheterization and the functional tests of the kidneys, the reader is referred to a separate work on this subject by the author.[1] In the present chapter, we shall therefore consider only the data furnished by catheterization of the ureter and pelvis.

Exploration of the Ureter

Ureteral exploration will reveal two principal pathologic conditions of this canal; i.e., stricture or obliteration, and calculi.

A. **Stricture or Obliteration.**—The difference between a stricture and an obliteration of the ureter, is not of great importance in the present connection. The fine ureteral catheter which is arrested at a certain spot, indicates in the simplest possible manner the exact location of the stricture, kink, or obliteration.

Ureteral strictures are recognized by the fact that a fine catheter will advance beyond a certain point at which a larger catheter is arrested. Ureteral obliterations, on the other hand, arrest all catheters at a given point, however fine they may be. The location of this point can be determined by measuring the exact length of catheter that has been introduced into the ureter.

B. **Detection of Ureteral Calculi.**—Searching for a calculus with the aid of the ureteral catheter results in very valuable information. When the catheter passes alongside of a calculus embedded in the ureteral wall, a distinctly characteristic grating sensation can be felt.

I have personally observed a case[3] in a man, aged thirty-nine years, who consulted me on November 29, 1907, because of numerous attacks of renal colic; sometimes the attacks were on the right side, at other times on the left, and they extended over a period of nine years. I catheterized the left ureter with a No. 7 catheter, through my direct

vision cystoscope. The catheter advanced to the renal pelvis, but while I was withdrawing it slowly, I distinctly felt a sensation of grating. Pappa, an intern of the Hospital, who was present, observed the same sensation. The diagnosis of a calculus seemed to be well founded.

Though radiography was negative, the patient passed two stones, each twice the size of a bean, nine days later. To make sure that these stones were identical with those felt with my catheter, I catheterized him again on December 13, but did not observe any sensation of friction.

Kelly, of Baltimore,[3] published reports of 38 cases, and has repeatedly emphasized the importance of this method in searching for ureteral calculi. For this purpose Kelly covers his catheter tip with a coating of oil and wax, prepared as follows: Olive oil, 100 parts, dental wax, 200 parts.

The tip of the catheter is plunged into this solution while it is still

Fig. 194.—Wax-tipped cathéters bearing the scratch marks of a calculus (Kelly).

slightly warm, and then permitted to cool in the air. The catheter thus acquires a polished, smooth and very delicate surface. The greatest care must be taken to deposit this coating uniformly over the catheter, so that there will be no appreciable roughness or unevenness on its surface.

This procedure will not only show the presence of a stone, but also its size as well. The deepest scratch marks are made by stones embedded in the ureteral wall, and which can be neither moved nor extracted.

Considerable difficulty is encountered in determining the exact location of the calculus. To obtain this information, Kelly resorts to the method described by Sampson, namely, of depositing at intervals on the length of the catheter, a series of small olivary masses of wax. When all these wax olives present an uninterrupted scratch line, we

may be certain we are dealing with a ureteral stone. On the other hand, the distance between the stone and the pelvis can be determined by measuring the length of the scratch mark; and in the same manner,

Fig. 195.—Ureteral calculi.

the distance from the calculus to the ureteral orifice can also be easily determined.

Kelly indicates the possible sources of error with this procedure:

PLATE XX

FIG. 1.—*Inflammation of the bladder neck.* On the floor are seen enormous edematous and hemorrhagic masses, which could be revealed only by the direct vision cystoscope. It is readily seen how these edematous masses, as the result of their evolution, can tend to the development of small papillomata, such as are illustrated in Plate XVII.

FIG. 2.—*Localized abscess of the bladder neck.* In this case, continuous recurrences of an obstinate urethritis were cured only as a result of incision of the abscess with the galvanocautery.

Fig. 1.

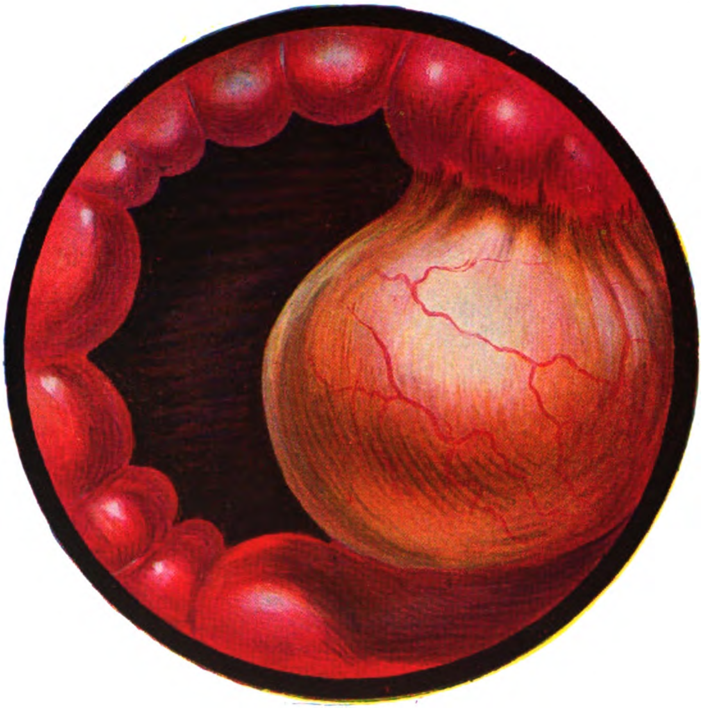

Fig. 2.

PLATE XX

1. Friction of the waxed tip with the cystoscopic tube. In this case, a flat and uniform depression is obtained, instead of a scratch line which a stone produces.

2. When the catheter is withdrawn, care must be taken not to permit it to come in contact with the pubic hair, which might impress a deceptive scratch mark on the wax.

3. The catheter should be inspected thoroughly before it is introduced, to be assured that it is perfectly smooth throughout.

In spite of these possible shortcomings, this procedure seems to be an excellent one. In renal calculi, however, it may fail; exact information can not be obtained when the renal pelvis is considerably dilated, or when the stone is small; and when the calculus is lodged in cavities in the substance of the renal parenchyma, the waxed tip is of no practical value whatever.

Another method which seems to avoid these disadvantages, was recommended by Follen Cabot.[4] This author attached the free end of the ureteral catheter to a stethoscope, or better still, a phonendoscope. He also placed a smooth metallic stylet in the interior of the catheter, one end protruding slightly through the eye of the catheter. The slightest contact between a stone and the tip of the metallic stylet, will be distinctly heard by the observer with the phonendoscope. According to this author, not only can the presence of a stone be detected with this method, but also its exact location in the ureter or the pelvis.

The ureteral catheter detects the presence of calculus in the ureter; but when the stone is situated in the lower part of the ureter, it can also be extracted with the aid of my cystoscope. The following case illustrates this point nicely:

A woman, aged thirty-one years, in the service of Pozzi,[5] had a calculus in the right ureter; its presence was confirmed by a radiogram made by Infroit, and also by vaginal examination. Ureteral catheterization with the direct cystoscope showed that all catheters were arrested at two centimeters from the ureteral orifice. A series of progressive ureteral dilatation was instituted, using flexible metallic bougies, Nos. 8, 10, 12, and even No. 16 Charrière. In this manner, I succeeded in obtaining a very distinct calcular contact.

To increase the dilatation, I then introduced bougies which were left *in situ* in the lower end of the ureter, for twenty-four hours. I then decided to attempt the extraction of the stone with a foreign body forceps; this entered the ureter easily enough, but I did not succeed in grasping the stone, nor could I move it from its position.

The diagnosis of embedded calculus was made, and verified a few days later, on operation by Pozzi. He did a subperitoneal lateral laparotomy and extracted the stone, with considerable difficulty. It was found completely embedded and very adherent to the mucosa, a fragment of which came away with the stone. In this particular case, it can be easily seen why the intraureteral intervention was unsuccessful.

Other foreign bodies, besides calculi, can likewise be extracted with fine forceps. This is well illustrated in the case fully described

on page 375. [Repetition of the details of this case has been thought inadvisable by the editor, who has taken the liberty of merely referring to it.—EDITOR.]

Another useful indication for ureteral catheterization, is to introduce a catheter into the ureter, to act as a guide in operations upon the ureter or upon adjacent organs.

REFERENCES

[1]Luys: Exploration de l'appareil urinaire, Paris, Masson, 1909, ed. 2, p. 519.

[2]Luys: Bull. et mém. Soc. de chir. de Paris, Feb. 12, 1908, p. 211.

[3]Kelly: My Experience with the Renal Catheter as a Means of Detecting Renal and Ureteral Calculi. Read before the third annual meeting of the American Urological Assn., June 8, 1904.

[4]Follen Cabot: A New Method for Detecting Calculi in the Ureter and Kidney, Am. Jour. Urol., March, 1905.

[5]Pozzi: Bull. et mém. Soc. de chir. de Paris, Feb. 26, 1908, p. 286.

Treatment of Nephritic Colic

This most useful application of ureteral catheterization in nephritic colic, has already been mentioned above. It is based on the generally accepted theory that nephritic colic is the result of a stone which starts from the renal pelvis and becomes engaged in the ureter on its way to the bladder.

Formerly the usual treatment was purely medical. It consisted in placing the patient in bed and the administration of hypodermic injections of morphine. This treatment was unquestionably uncertain and did not give the most effective results. At present, ureteral catheterization, properly employed, seems to be the most desirable method of treatment. We may properly ask, "Why should we leave this task to be done poorly by nature, when we can aid her materially in her effort?"

The calculus has a tendency to descend along the ureter; then why not encourage this tendency and facilitate this movement, particularly when the stone has been retained for some time or even may remain indefinitely in the ureteral canal because of some roughness of its surface? It is also essential to avoid at any cost the grave complications like hydronephrosis and consecutive renal infections which often result from the retention of a stone, and which are invariably fatal in their consequences.

The following history of a case is particularly typical:

A man, aged sixty years, who had been in the habit of taking his annual cure at Contrexéville, found himself unable to take his usual treatment. On June 17, 1911, while feeling perfectly well, he suddenly felt a sharp pain in the right kindey, which radiated down the ureter toward the testicle, and had all the characteristics of renal colic. This condition lasted two or three days without cessation.

On June 19, Bobier, who was attending him, observed that bimanual palpation of the right kidney produced a constant and very characteristic pain; also that rectal examination provoked a sharp pain when the inferior extremity of the right ureter was palpated. The patient was then referred to me for a cystoscopic examination.

I found the bladder perfectly normal; likewise the left ureteral orifice. But the right ureteral orifice was dilated enormously; the vesical portion of the ureter seemed turgid, inflamed, and dilated so that it resembled the neck of the uterus. This was highly suggestive of a ureteral lesion. A No. 6 catheter penetrated about one centimeter into the ureter, where it was arrested for a few moments, during which time it was noticed that pus was exuding from the ureteral orifice. After a few attempts, the catheter was advanced further and we found that there was an undoubted pyelitic retention of about 33 c.c. The fluid thus obtained was bloody and contained blood clots. The pelvis was irrigated with a 1:1000 solution of silver nitrate; and while the catheter was being withdrawn, a very typical and characteristic friction sensation was distinctly felt.

The patient went home, relieved of all his pains. The same evening he voided a small stone with the urine; the latter became clear and all morbid symptoms disappeared.

In this case, therefore, catheterization produced an excellent result; on the one hand, it relieved the patient of his pains, and on the other, it prevented the usual complications; i. e., hydronephrosis, pyonephrosis, renal infection, etc.

Exploration of the Renal Pelvis

The indications for the exploration of the pelvis with the ureteral catheter, may be summed up as follows:

1. The Detection of a Calculus in the Pelvis.—The operative technic is the same as that for ureteral calculi; full details have been given in the preceding chapter.

2. To Confirm a Diagnosis.—In difficult cases when the diagnosis is doubtful, it is not known whether the disease is located in the kidney, or in surrounding organs; i.e., the spleen, liver, ovary, etc. In such instances, following Kelly's suggestion,[1] it is well to catheterize the ureter and distend the pelvis with a fluid injected slowly. A slight pain is thus produced, and when the patient recognizes this pain as being similar to his usual pains, their renal origin may be taken for granted.

3. To Determine the Capacity of the Renal Pelvis.—This is an extremely interesting subject, which has not yet been thoroughly developed.

Determination of the Pelvic Capacity

The systematic study of the pelvic capacity enables us to estimate the degree of destruction of the renal parenchyma and also furnishes definite and valuable indications as to the surgical measures to be taken. In cases in which there is a considerable pelvic dilatation, there must be urinary stagnation or suppuration, the amount of which must be determined. If this suppurating focus is considerable in quantity, nothing but nephrectomy can be advised. On the other hand, when the

pelvis is but slightly dilated, stagnation is limited and the complete removal of the kidney is therefore not indicated.

Exceptions must be made, however, in renal tuberculosis and neoplasms. In these conditions, when the diagnosis of tuberculosis or neoplasm has been definitely made, nephrectomy is the operation of choice with the vast majority of surgeons. But in other conditions, renal lithiasis or hydronephrosis, for example, the capacity of the pelvis is a preponderating factor in the method of treatment to be adopted.

It is absolutely essential to possess precise information before the surgeon takes his knife in any surgical intervention on the kidney. Some surgeons are satisfied with clinical symptoms, or with the findings of the kidney exposed on operation; but these are really not wise procedures, for it has often occurred that even with the kidney delivered, the surgeon has been unable to determine what was wrong with it. It is therefore far more rational, more definite and more prudent, to examine the patient methodically so as not to operate blindly, but according to exact information acquired beforehand.

Technic of the Determination of the Pelvic Capacity

The catheter is introduced into the ureter and up to the pelvis, and left there for a few moments, during which time the urine flows normally. Then the patient is placed in the horizontal position. A graduated syringe, filled with boric acid solution, is attached to the catheter and the fluid injected very slowly and carefully, meanwhile instructing the patient to announce when he feels the slightest sensation of pain. In the normal case, this pain appears suddenly as soon as about five c.c. have been injected. If the injection is not made very slowly, extremely violent pains may result.

The advantages of this procedure may be realized from the following case histories:

Case 1.—M. S., male, aged fifty-six years, was referred to me, on July 1, 1905, by Suarez de Mendoza, of Madrid. Thirty years previously he had had several attacks of right renal colic, which culminated in the expulsion of small calculi.

He was perfectly well up to two and a half years ago, when he was suddenly seized with severe pains on the left side, followed by hematuria of renal character. At times the urine was clear, at other times bloody. Six months ago, the hematuria ceased and the urine became purulent.

On examination the urine was found purulent. Guinea-pig inoculation done some time previously, was negative; the animals gained in weight and were in excellent health since the inoculation.

The urethra is free, the bladder has an excellent capacity, and the kidneys can not be palpated.

Urinary separation was easily accomplished, with this result: On the right side, the urine is normal and flows in rhythmic and regular ejaculations; on the left side, the urine is foul and cloudy, and flows continuously drop by drop.

Chemical analysis shows the following:

	RIGHT KIDNEY	LEFT KIDNEY	MIXED (BLADDER)
Quantity	8.7 c.c.	8.6 c.c.	
Freezing point	–1.48°	–0.72°	–0.20°
Urea per 1000 c.c.	14.12 gm.	6.55 gm.	12.88 gm.
NaCl	8.50 "	5.00 "	8.50 "
Index of refraction	1.340,822	1.336,670	1.338,960
Sediment	*Microscopic Elements* 1. Numerous red blood cells; 2. Polynuclear leucocytes, much in excess of the white blood cells, but considerably less in quantity than on the opposite side; 3. Bladder cells.	Principally pus and a few bladder cells.	Solely pus

The diagnosis was clear: Left pyonephrosis with sufficient function of the right kidney. The necessity of surgical intervention on the left kidney was imperative; but what was the particular operation that was indicated?

To answer this question, I catheterized the left ureter on July 8. The pelvic capacity in three different tests, was fifteen c.c. each time. This showed that the pelvis was but little dilated and that the renal parenchyma was but slightly damaged. Consequently nephrectomy was rejected, and nephrotomy decided upon.

The patient was referred to Béclère, for a radiogram, which revealed the presence of calculi in the left kidney.

These three successive examinations therefore gave us the following data: The segregator showed a left pyonephrosis; catheterization showed little pelvic dilatation and slight parenchymatous destruction; and the radiogram demonstrated the presence of calculi in the kidney.

Nephrectomy was performed by de Mendoza, at Madrid, on September 10. He found five stones in the pelvis and upper portion of the ureter.

By way of contrast with the preceding case, the following case may be mentioned:

CASE 2.—H. M., female, aged forty years, had been pregnant fourteen times; ten went to full term and the others were abortions. Most of her children died in early infancy. The patient now has but two living children, one nine and a half years old, healthy, the other seven, with Pott's disease. Patient had measles and chicken pox in her youth; otherwise she was always well up to her twelfth pregnancy, when she had attacks of hematuria and aborted in the fifth month. After the abortion the hematuria ceased. But the urine has always been cloudy since then, leaving a whitish precipitate on standing.

During her last pregnancy, when she was two and a half months pregnant, she entered the maternity ward of the Saint Antoine Hospital, in the service of Bar (December 11, 1903). At that time, the urine was purulent, with an abundant white deposit. Microscopic examination revealed numerous pus cells, but no blood cells. Bimanual palpation of the left kidney revealed that it was painful on pressure and enlarged. No pain over the right kidney, nor in the hypogastric region.

Separation of the urines was performed by me on December 19, and showed clear

urine on the right side, and purulent urine on the left. Chemical analysis of the separated urines, made by the intern of the pharmacal service, was as follows:

	RIGHT KIDNEY	LEFT KIDNEY	MIXED (BLADDER)
Reaction	acid	alkaline	acid
Urea (per liter)	29.84 gm.	2.56 gm.	12.66 gm.
Chlorides	9.00 "	4.00 "	8.00 "

This examination showed that almost all the urinary depuration was being done by the right kidney.

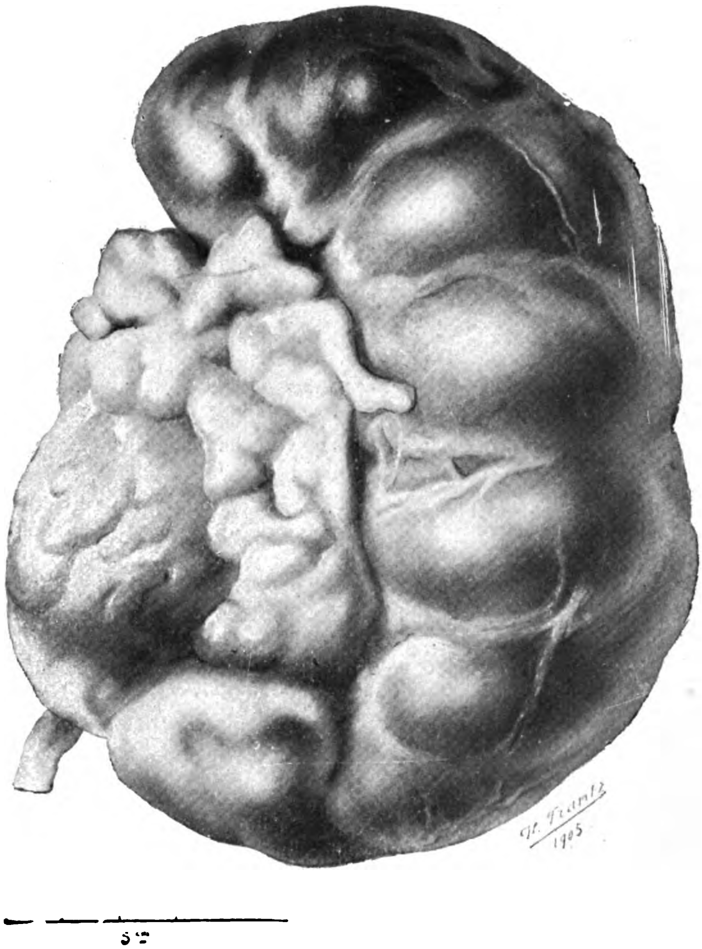

Fig. 196.—Calculous pyonephrosis (external aspect).

At that time, the patient was two and a half months pregnant. This was terminated in the sixth month by an abortion. She came to see me on April 28, 1905, presenting a large painful mass on the left side; it moved distinctly with the respiratory movements.

The left ureter was catheterized with my direct cystoscope. Nothing came through the ureter at first, but after bimanual pressure, a flow of pus appeared. The pelvic capacity was over 150 c.c. On May 4, a second catheterization gave the same results, and the patient felt pain only when 150 c.c. had been injected.

The evidence in this case was clear. We were dealing with an enormous left pyonephrosis; the renal parenchyma was much altered, if not totally destroyed; nephrectomy was clearly indicated.

This was done on May 23, at Laennec Hospital. The kidney was enormous (Figs.

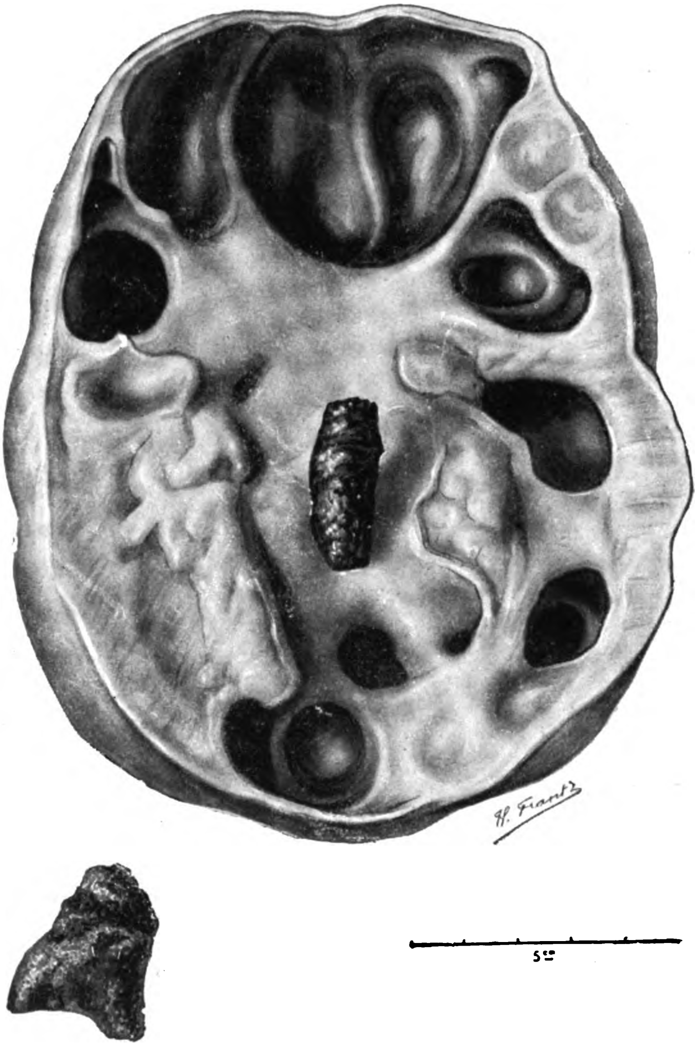

Fig. 197.—Calculous pyonephrosis. The calculus is seen in the center of the pelvis, and is illustrated separately in the lower left hand corner of the illustration. The pelvic capacity of this kidney was over 150 c.c.

196 and 197). It was irregular in shape, its walls were thinned, the parenchyma converted into a purulent sac; at the hilum, in the pelvis, we found a large calculus.

A third instance seems even more characteristic:

Case 3.—A woman, aged fifty-three years, was referred to me on November 15, 1905, by Gaston Alexandre. She complained of having had cloudy urine for over a year; occasionally she had hematuria aggravated by walking or riding, and disappearing under the influence

of rest. She also had a slight increase in urinary frequency,—every two hours by day, and three times during the night.

On examination, the urine is cloudy, with a heavy deposit; the bladder seems to be normal; its capacity is over 250 c.c.; irrigation is easy, the fluid coming out clear rather quickly. Palpation of the kidneys is negative; neither organ can be felt; there is no ureterovesical reflex.

Separation of the urines showed that the urine from the right kidney flowed with regular and rhythmic ejaculations, and was perfectly clear; from the left kidney, the urine was very cloudy. Chemical analysis made by Mauté, showed the following:

	RIGHT KIDNEY	LEFT KIDNEY	MIXED (BLADDER)
Quantity	11.8 c.c.	10.2 c.c.	
Urea per liter	10.93 gm.	11.92 gm.	10.92 gm.
Freezing point	–1.36°	–1.40°	–1.42°
Index of refraction	1.338,770	1.338,998	1.339,606
Sediment	1. Some red blood cells, with occasional leucocytes (in the proportion of blood elements). 2. Occasional bladder epithelium. 3. Crystals of oxylate of lime.	1. In great quantity; polynuclear leucocytes, constituting a distinct microscopic pyuria. 2. In small numbers in the same proportions as on the opposite side, — red blood cells and bladder cells.	1. Polynuclear leucocytes abundant (pyuria). 2. Some bladder cells.

The diagnosis of left pyonephrosis was made. To determine the condition of the left kidney, the left ureter was catheterized on November 21, with my direct cystoscope. At that time the patient was in the midst of an attack of hematuria. The bladder seemed normal, likewise both ureteral orifices. A No. 7 catheter was introduced up to the kidney and a distinctly bloody urine was obtained. At the same time, a soft catheter (Nélaton) placed in the bladder, showed that the urine coming from the opposite kidney was clear. A second chemical analysis was made by Mauté with the following result:

	RIGHT KIDNEY	LEFT KIDNEY
Quantity	11 c.c.	7 c.c.
Freezing point	–1.62°	–1.62°
Urea (per liter)	12.73 gm.	13.50 gm.
Sediment	Abundant amorphous urates. Uric acid crystals. Fairly numerous red blood cells, about ten times as many as on the opposite side. Also bladder cells.	Very many red blood cells. Very many polynuclear leucocytes, constituting a real pyuria. Some small round epithelial cells from the kidney or pelvis. Large epithelial cells in round heaps, with a large nucleus, and which it is difficult to localize. Numerous cocci arranged in pairs and in masses.

The left pelvic capacity was found to be barely two c.c.; this showed that it was not distended. A radiogram was made by Béclère, who stated that "the examination of this picture does not give definite evidence of the presence or absence of a stone."

Consequently we thought we had a case of simple pyelitis. The pelvis was irrigated once in eight days for a month. These irrigations, made with a 1:1000 solution of silver nitrate, immediately stopped the hematuria for about four days, after which period it reappeared. The result being unsatisfactory, an operation was decided upon after consultation with Alexandre.

In point of fact, separation of the urines pointed to a left pyonephrosis; the pelvic capacity demonstrated there was no dilatation. Finally, the two chemical analyses indicated a normal functional capacity for the left kidney.

We concluded that the kidney should be conserved, and decided upon a nephrotomy. This was done by Alexandre and myself on January 27, 1906. A large lumbar incision was made, the kidney exposed, and through the external surface of the organ, I could distinctly feel the presence of a stone. The outer margin of the kidney was incised and the parenchyma split open up to the pelvis. The index finger introduced into the pelvis, easily delivered an extremely large, movable calculus. It seems very hard, is 12 mm. in length and 11 mm. in breadth. The ureter seems normal. The wound was closed with two rows of catgut sutures; finally, three planes of sutures for the muscular and superficial layers. Recovery without incident. Alexandre saw the patient again two years later; she was in excellent condition.

It can therefore be seen, from a study of these three cases, that the capacity of the pelvis should be known definitely before resorting to operation. The principal advantages of this procedure, are these:

1. In renal lithiasis, hydronephrosis, simple nontuberculous pyonephrosis, the exact knowledge of the pelvic capacity will determine whether nephrotomy or nephrectomy should be performed. We do not pretend to say that this method of diagnosis is the only one to decide this question, but it will undoubtedly contribute materially in the selection of the operative procedure.

2. When the pelvic capacity is found greatly increased, and nephrectomy has been decided upon, it is highly important that this operation should be performed at once, without preliminary incision into the organ, so that if pyonephrosis is revealed, the kidney can be removed in its entirety. By doing this, it will be possible to avoid infection of the wound by the renal pus, and will permit closure of the wound by primary union; this occurred in our Case No. 2, just described.

REFERENCE

[1]Kelly: The Use of the Renal Catheter in Determining the Seat of Obscure Pain in the Side, Am. Jour. Obst., 1899, xl, No. 3.

Ureteral Catheterization in Kidney Function Tests

In the performance of functional tests of the kidney, the role of ureteral catheterization is extremely limited,—much more so than in

the exploration of the ureters and pelvis; and it should be employed only in such cases in which my "urine segregator" can not be utilized.

It goes without saying that the duality of the renal glands necessitates a double analysis; the analysis of the separated urines is therefore universally accepted as a matter of routine. We shall not emphasize this point; it is sufficient to say that this important idea is due to the unceasing efforts of Albarran, who advocated it steadily since 1897.

Beyond doubt, the simultaneous ureteral catheterization continued during twenty-four hours is the only method that is strictly and absolutely exact. This is indeed an ideal theoretical method, but in actual practice it can not always be carried out.

Nor shall we enter into the discussion which raised such violent polemics between the advocates of my "separator" and those who favored ureteral catheterization. This question, which will be the subject of another work, does not seem to be within the scope of this book, devoted solely to the study and consideration of vesical endoscopy.[1]

REFERENCE

[1]Luys: Exploration de l'appareil urinaire, Crowned by the Academy of Medicine, Laborie Prize, 1907, Paris, Masson, 1909, p. 430; also, Presse méd., August 24, 1910, p. 641.

Treatment of Pyelitis by Pelvic Lavage

Lavage of the pelvis, studied for the first time in France by Albarran in 1898, can not be applied in every case of pyonephrosis. In renal tuberculosis, it has no value whatever, and moreover, it is absolutely contraindicated. Its best results are attained in the milder types of pyelitis, without extensive involvement of the parenchyma. In renal lithiasis, pelvic lavage has no more effect than bladder irrigation has on the cystitis which accompanies a vesical calculus. To repeat, then, pelvic lavage is of service only in the mild forms of pyelitis.

In an interesting memoir published in 1904, Rafin, of Lyons, has well said that pelvic lavage is efficacious only in cases in which there are no mechanical obstacles, because in such cases surgical intervention is absolutely essential. Lavage may be utilized as palliative treatment when there exists a contraindication to operation, or for the alleviation of local or general symptoms before surgical intervention. When pelvic irrigation is followed by untoward phenomena, like chills, or a rise in temperature, it must be discarded.

Technic of Pelvic Lavage

For lavage, the largest possible ureteral catheter must be employed,—No. 7 or 8; the tip should be flute-shaped, and should bear two lateral eyes. The catheter is introduced into the ureter and advanced until slight resistance is felt. At this moment the progress of the catheter must be stopped so as to prevent its coiling upon itself within the pelvis. The ideal position of the catheter is with its extremity at the entrance of the pelvis, just as a vesical catheter should be at the vesical neck, in irrigation of the bladder. The best way to determine whether or not the catheter is properly placed, is to wait a few moments and observe whether the flow of urine from the pelvis is normal or otherwise. If the catheter is advanced too far, it can easily be withdrawn a few centimeters toward the lower extremity of the pelvis; but it is quite difficult to push it forward again. In practice, the catheter is therefore advanced with the cystoscopic tube until it begins to bend on itself at the external ureteral orifice.

The cystoscope is now withdrawn; the patient is placed in the full horizontal position. When the urinary flow is not normal it is advisable to withdraw the catheter one or two or even three centimeters, at the most. In an infected pelvis, irrigation should not be begun until the purulent urine has ceased flowing under manual pressure; that is, when the drops fall from the catheter slowly, at long intervals and without force.

Effective lavage is attained only after the pelvic mucosa has been cleansed of all its pus; that is, when the boric acid solution comes out perfectly clear. To obtain this result, the solution is injected with a syringe, provided with a fine cannula, that can be fitted tightly to the catheter. The injection is continued until a slight pain is felt by the patient in the corresponding hypogastrium. The piston of the syringe is pushed very slowly and gently so as to avoid the creation of any tension in the pelvis; this might bring on severe pain and possibly syncope.

The quantity of fluid thus injected, varies according to the individual patient; sometimes 10 c.c. are sufficient, while at other times even 150 c.c. are insufficient to fill the pelvis to its maximum capacity.

Evacuation of the filled-up pelvis can be accelerated by slightly pressing the abdominal wall in the region of the affected kidney; or the patient himself may assist by contracting his diaphragmatic and abdominal muscles, as in coughing. In a particular case, I once ob-

PLATE XXI

FIG. 1.—*Bullous edema of the vesical fundus.* The result of a concomitant uterine cancer. "Cushion" appearance.

FIG. 2.—*Initial phase of the invasion of the vesical fundus* by cancerous infiltration due to a concomitant uterine cancer. The mucosa has a dark, ecchymotic color, and in various places presents slight hemorrhages.

Fig. 1.

Fig. 2.

PLATE XXI

served that the irrigating fluid flowed out of the catheter in a continuous stream as a result of the efforts made by the patient.

After the cleansing irrigation has been completed, the therapeutic lavage is given, the following solutions being commonly used:

Solutions Employed.—A 1:1000 solution of silver nitrate has always given me the most satisfactory results. Dilute hydrogen peroxide invariably gave me the poorest results. It decomposes, producing numerous gas bubbles, which are too large to pass out of the ureteral catheter; they thus inflate the renal pelvis and produce considerable pain. This solution should never be employed. Potassium permanganate irrigations, 1:4000, also give good results. Oxycyanide of mercury, 1:8000, have been used by Féodorff. Collargol, 2 or 3 per cent, can be used, but Legueu has observed infiltrations and infarcts of the renal parenchyma after its employment. Aluminum acetate, 1 per cent, has been used by Kall. [American authors seem to prefer Argyrol, for pelvic lavage, in solutions varying from 5 to 25 per cent.—Editor.]

Frequency and Number of Irrigations.—These vary according to the individual case. They depend on the nature of the infection, the degree of pelvic distention and a number of other concomitant symptoms. On the average, lavage should be performed about two or three times weekly, depending on the case. In the great majority of cases, once a week is usually sufficient.

In some cases of pyelitis, excellent therapeutic results can be obtained in a short time, after two or three irrigations. I have seen a very interesting case, with Abel Desjardins, the patient being a woman with febrile movements, purulent urine, and painful right kidney. The patient was completely cured after three irrigations.

In other cases, pelvic lavage must be repeated more often and carried out with considerable patience. Kelly catheterized a patient 120 times before he obtained the desired result.

Notwithstanding the fact that the pelvis may have been thoroughly and permanently disinfected through lavage, patients should be kept under careful observation, because of the possibility of recurrence.

When this method of treatment is unsuccessful, it is usually due to an existing infection of the renal parenchyma.

The following is the history of a case of pyelonephritis treated with pelvic irrigations:

Right Pyelonephritis Treated With Pelvic Lavage.—L. Ch., male, aged thirty-five years, presented himself on July 17, 1903, complaining of cloudy urine of three years' dura-

tion. Some time previously he had passed urine containing red sand, but since then his urine became cloudy and the sand had not reappeared. His general condition is good, no pain on urination, no increased frequency, but has a constant pain in the right kidney region. The ureter is normal, bladder likewise, with a capacity of over 450 c.c. His urine is very cloudy and contains pus. The left kidney can not be palpated; the lower pole of the right kidney is slightly perceptible.

Urinary separation on July 23, showed scanty and cloudy urine on the right side, abundant and slightly hazy urine on the left side.

Chemical analysis made by Giraudeau, was as follows:

	RIGHT KIDNEY	LEFT KIDNEY	MIXED (BLADDER)
Quantity	8 c.c.	28 c.c.	
Urea (per liter)	9.80 gm.	11.52 gm.	12.61 gm.

This result proves that the left kidney secretes considerable urine, and that its eliminating function is excellent; while the right kidney secretes little urine and eliminates poorly.

The patient being in good general condition, is put on a regime of milk, diuretic waters, urotropin. Under this regime the pains diminished, but the urine is still cloudy.

On September 28, general condition still good. In October, a radiogram was taken by Béclère, with negative result. On January 11, 1904, the patient is still in good condition, pain has entirely disappeared. The right kidney is no longer palpable, but the urine is still cloudy. The patient remained in this condition an entire year.

In January, 1905, he came to see me on account of the persistence of cloudy urine. At this time the patient was having occasional pains in the right lumbar region.

In the belief that the right kidney function was good, and that his general condition was fair, I thought that pelvic lavage might bring about good results. The ureter was then catheterized with my direct cystoscope on January 19. A No. 7 catheter was left in place for nearly half an hour, and the urine thus collected was analyzed by Mauté, with this result:

Freezing point	–1.01°
Urea, per 1,000 c.c.	9.20 gm.
NaCl " " "	6.50 "

Sediment: Leucocytes in large number, especially polynuclear.
Blood.
Numerous pelvic cells.
Very many microbes (bacilli and especially cocci, of which many are grouped in the form of streptococci) but which it is impossible to differentiate by direct examination; no tubercle bacilli.

The pelvis was washed freely with boric acid solution and then with 1:1000 silver nitrate solution. Several lavages were given at eight-day intervals. The patient informed us that on the day when the lavage was given, the urine was very cloudy, but that it became much clearer and without the deposit on the second, third, and fourth days thereafter. The renal pains disappeared entirely after the first irrigation, and he no longer felt his former lumbar lassitude.

At any rate, this direct method of treatment, though not absolutely radical, was carried on without any inconvenience to the patient. He was irrigated in the morning and he then attended to his usual occupation the rest of the day without suffering any inconvenience.

Ureteral Catheterization—À Demeure

The ureteral catheter left *in situ (à demeure)*, may in some cases, facilitate closure of a lumbar fistula. I have seen the beneficial results

of this procedure in several instances. One case is particularly interesting: A woman with a ureteral stone, resulting in anuria and serious general symptoms. The case was reported before the Surgical Society.[1] I was compelled to do an emergency nephrotomy. Though the patient felt better and the stone had been removed by a ureterolithotomy, the wound did not close, and a lumbar fistula persisted.

A No. 12 catheter was introduced through my cystoscope and left there. Immediately afterward it was found that the kidney bandage

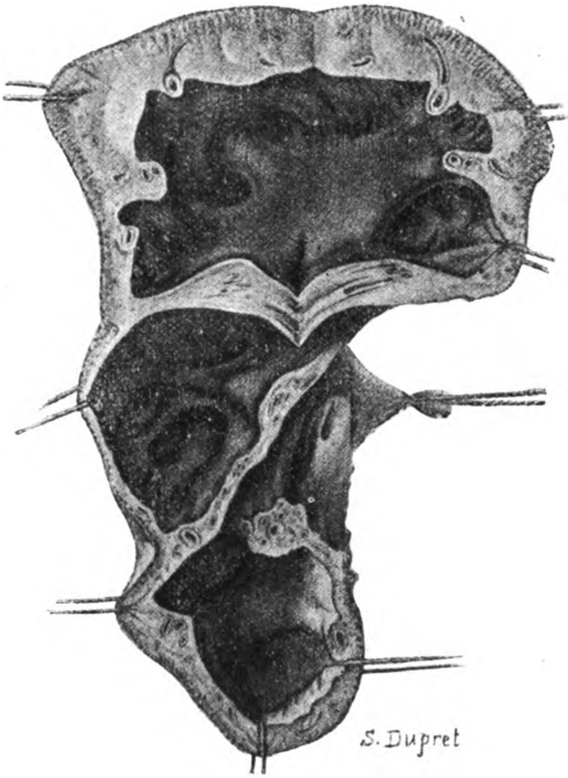

Fig. 198.—Congenital hydronephrosis resulting in an abdominal renal fistula.

was no longer being soaked with escaping urine, and it remained thus, absolutely dry; all the urine from the left kidney was being collected by the ureteral catheter. The latter was left in place for seven days, and when it was withdrawn, the patient voided urine abundantly through the natural channels.

In another case[2] of renal fistula consecutive to a congenital hydronephrosis infected during the course of typhoid fever, I thought the fistula might close and the normal function of the kidney might be established by the introduction of a permanent catheter in the cor-

properly [illegible]. I tried to insert a No. [illegible] catheter but quickly changed it to a No. 5. Because of [illegible] the latter could be introduced only with the aid of my [illegible] in point of fact, no other catheter could bring about the desired result.

Drainage was poor, because very little urine came through the catheter. On the other hand, all the fluid injected through the catheter came out immediately through the abdominal fistula. Because of this failure, I performed nephrectomy, and this was followed by the most satisfactory results. Figure 1[illegible] shows clearly that we were dealing with an infected congenital hydronephrosis.

In true pyonephrosis, evacuation, and regular drainage of the pelvis can be accomplished neither by pelvic lavage nor by the permanent catheter. Surgical intervention is absolutely imperative.

In aseptic uronephrosis, permanent catheterization is also ineffective, because the catheter will inevitably infect the uronephrotic sac. In calculous anuria, catheterization can be recommended when it can be done quickly and easily. Krebs[3] succeeded in displacing a stone and provoked diuresis by injecting glycerin into a ureter.

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[2]Legueu: Fistule rénale abdominale consécutive à une hydronéphrose congénitale infectée au cours d'une fievre typhoide, Nephrectomie, Guerison, La Clinique, Aug. 16, 1912, p. 517.

[3]Krebs: Zur Therapie der Anuria Calculosa, St. Petersb. med. Wchnschr., No. 52.

Radiography of the Ureteral Catheter

De Hyes[1] first suggested the introduction of a flexible metallic wire into the ureteral catheter in order to determine any abnormality in the direction of the ureter, or to locate the site of an obliteration in its lumen. A radiogram is then made, and the catheter, opaque to the roentgen rays is seen perfectly in the photographic plate.

A very simple expedient is to place fine silver threads in the catheters. At present such opaque catheters are being manufactured; they contain a substance in their texture which stops the x-rays, thus making them visible in the plates.

REFERENCE

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Pyelography

Voelcker and Lichtenberg, combining ureteral catheterization with radiography, injected a seven per cent solution of collargol into the

ureter and pelvis through a ureteral catheter. In this condition, a radiogram is taken. The pelvis thus distended by the collargol, gives a very definite picture. This method is known as pyelography.

This procedure is complement to the determination of the capacity of the pelvis. It is evident that measurement of the pelvic capacity when properly performed, shows quickly and distinctly the degree of distention and the extent of the hydronephrosis. But when we desire corroboration by the aid of a photographic picture, which makes a stronger impression on the eye, it is evident that pyelography may render excellent service.

Krotoszyner,[1] of San Francisco, uses solutions of cargentos instead of collargol. A 25 per cent solution, according to this author, is absolutely without danger, but he opposes the use of a 50 per cent solution on the ground that it may irritate the upper urinary tract.

This author places the patient in the partial Trendelenburg position, injects the silver solution into the pelvis, and immediately makes the radiogram. He has obtained very exact information from the viewpoint of possible surgical intervention, through the use of this procedure. One of his cases is particularly interesting:

A gardener, aged forty-one years, suffered constantly from left nephritic colic; pyelography made possible the diagnosis of a marked hydronephrosis. Nephrectomy confirmed this diagnosis; the origin of this condition is of unusual interest. During the decortication, marked adhesions were found at the upper pole of the kidney; these adhesions consisted of abnormal blood vessels, which completely enveloped the ureter.

This interesting case corroborates my opinion[2] that one of the principal causes of hydronephrosis is the pressure at the inferior pole of the kidney of abnormal blood vessels coming directly from the aorta.

Frank Kidd[3] of London, who published an interesting work on pyeloradiography, particularly recommends this method of investigation as a preliminary step to operations on the kidney. He believes that the collargol, cargentos, and other solutions employed, always cause a certain degree of renal irritation, and adds that a really painless agent is still to be found.

He recommends a 5 per cent or 7 per cent solution of collargol, injected under low pressure. According to this author, pyeloradiography should be done only by those capable of selecting the cases, that is, those cases in which an exploratory operation would otherwise be necessary. The risk is much less with this method than with an exploratory operation. He also advises strongly against the practice recommended by some authors of filling the same kidney three or four

times with strong solutions (15 to 50 per cent). [American urologists have had excellent results with a 15 per cent solution of Thorium, as suggested by Burns.[4] A splendid review of the entire subject of pyelography is given by Braasch[5] in his monograph of the subject.—EDITOR.]

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[4]J. E. Burns: Jour. Am. Med. Assn., June 26, 1915, pp. 2126, 2127.

[5]Braasch: Pyelography, W. B. Saunders Co., 1915.

CHAPTER IX

PRACTICAL APPLICATIONS OF CYSTOSCOPY

Thanks to the improvements brought about in recent years, cystoscopy has made possible an admirable view of the mucous membrane of the bladder; but its limits are not restricted to the visual examination alone, for it has in addition, numerous therapeutic applications. If the mucosa and its lesions in their pathologic state can be seen well, a suitable therapy can be arrived at. In this respect, direct vision cystoscopy surely shows its superiority, for it enables us to apply the treatment as well as to recognize the lesion.

We will now take up the following subjects in succession:

The treatment of vesical tumors, of foreign bodies in the bladder, of cystitis, of calculi of the ureteral extremity, and vesical biopsy.

TREATMENT OF BLADDER TUMORS

For a long time general surgeons and specialists have been trying to work out a precise formula for the treatment of vesical tumors. Hitherto suprapubic cystotomy alone seemed to meet this indication; at the present day, however, this view has changed entirely because the endovesical treatment of these tumors has come to be considered first and foremost, owing to the great progress that it has made.

Indications for Suprapubic Cystotomy.—Suprapubic section is indicated only when the endovesical method can not be applied; i. e., when the urethra does not allow the introduction of large enough instruments, or when the size of the tumor to be extracted is too great. With this method there is an abundance of light and space to work in, and consequently large tumors with large bases can be readily reached.

As to cancer of the bladder, when the histologic diagnosis has been well established, there seems to be no particular advantage in excising the tumor by the suprapubic route, unless it is well circumscribed and localized, from the very beginning. In these cases, as in all cancers, the affection is still local and should be removed by the suprapubic route. But when the walls of the bladder have already become infiltrated and the tumor has spread widely, it seems there is nothing to be gained by operating, because surgical intervention pre-

cipitates further developments in the growth, much more rapidly than the natural and normal evolution of the disease itself.

The results obtained in the treatment of vesical cancer suprapubically, with or without resection of the vesical wall, are not very encouraging, and too deceptive to advise the employment of this always serious method. We may therefore conclude that the endovesical treatment of vesical tumors is the method of choice and that the suprapubic operation should be applied only in cases in which the preceding method can not be resorted to.

Endovesical Treatment of Bladder Tumors

The ideal purpose of the endovesical treatment of bladder tumors is to destroy the neoplasm by way of the natural channels without having recourse to the surgical opening of the abdomen. The endovesical method through the perfection of its highly specialized instrumentation has won the approval of most urologists. Generally speaking, it may be said that this method can be applied to all benign tumors, which are not very large or widespread. The principal indication for this method will therefore be found in small papillomata. At the present time, it is considered neither rational nor reasonable to perform a suprapubic cystotomy for a small vesical papilloma, and even for larger papillomatous masses. The endovesical treatment must be considered the method of choice.

As regards cancerous tumors, neither the endovesical nor the suprapubic method may be considered really curative. However, the former can be utilized much more successfully than any other method of treatment as a palliative measure. When the cancerous tumors are accompanied by profuse hemorrhages, which put the patient's life in jeopardy by their frequency or profuseness, it is of immediate benefit to attempt to control the source of bleeding by direct applications of adrenalin or by the use of the actual cautery; but it goes without saying, this treatment is only palliative and symptomatic.

The endovesical treatment can be applied by various methods, each having its own special advocates. These are as follows: Galvanocautery, the cold or hot snare, electrocoagulation and sparking, electrolysis and radiotherapy.

Galvanocauterization

This can be applied in two ways; i. e., with the indirect vision cystoscope (Nitze's method) and with the direct vision cystoscope.

1. **With the Indirect Vision Cystoscope (Nitze's Method).**—The endovesical treatment of bladder tumors by galvanocauterization has been called the method of choice by Nitze, and in a remarkable work, Weinrich, of Berlin, has taken up its defense eloquently.

Nitze[1] devised a special cystoscope for the treatment of bladder tumors. This instrument was an ordinary cystoscope covered with a metallic sheet movable over the body of the cystoscope. Its extremity was slightly curved, with a galvanocautery attached to its concavity. This galvanocautery, spiral in shape, was made incandescent by the passage of an electric current. Over and behind the galvanocautery there was also a metallic snare which could be used either hot or cold, its operation being controlled by an outside wheel and shuttle-cock (Fig. 199). The whole constituted an instrument so large that it could be inserted into the male urethra only with great difficulty.

The operative technic was to fill up the bladder, as usual, to in-

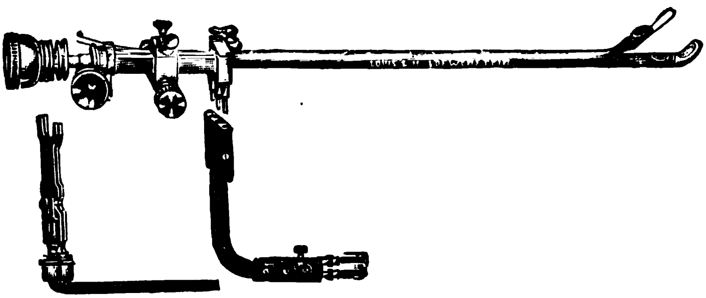

Fig. 199.—Nitze's operating cystoscope.

troduce the instrument according to the usual rules, find the tumor and apply the galvanocautery directly upon it. Sometimes the galvanocautery was used, at other times the cold or hot snare. With the latter, masses of tumor were torn off piecemeal at different sittings, after which the tumor base was cauterized energetically with the galvanocautery. The pieces of tumor were left in the bladder to be expelled later with the urine. Bleeding occurred with this method, but these hematurias never assumed a serious character; they stopped after a rest in bed. I had the opportunity of witnessing Nitze use his instrument on a patient in Berlin, and I was convinced his instrumentation was difficult and complicated even in the hands of its author.

In addition this method had a serious disadvantage. The operation being performed through the fluid which distended the bladder, the platinum wire of the cautery had an imperfect incandescence, being immediately cooled by the presence of the water. In order to obtain the total destruction of the tumor by this method, it was therefore

necessary to employ many sittings. Finally another difficulty was encountered in maintaining the bladder fluid absolutely transparent so as to be able to make an exact and precise application of the current upon the vesical tumor.

However, the statistics furnished by Weinrich[2] of the applications by Nitze up to the end of 1904, comprised 399 cases of bladder tumor. Of these, 177 were malignant, 94 were benign and 128 could not be accurately classified, for want of tissue for microscopic examination.

Of 101 papillomata operated upon by Nitze, he found no recurrence in 71 cases, recurrence in 18 cases, and 12 cases were lost sight of.

Recently, Marion[3] attached a special cautery forceps to an indirect vision cystoscope for the treatment of vesical tumors, but its disadvantages are the same as those of Nitze's instrument; that is, it is complicated, pieces of tumor often remain adherent to the lens of the cystoscope thus obliterating the operative field, the vesical fluid must be changed frequently; these manipulations complicate and prolong the technic; the cauterization being made in water, it is undoubtedly less efficacious; finally, the attack on the tumor is always indirect, because of the lenses which reverse the image, a fact that renders the treatment more complicated and difficult.

Nevertheless this method can be utilized in special cases in which direct vision cystoscopy can not be done easily; for instance, when abdominal plethora prevents the unfolding of the bladder in the inclined position of the pelvis. Direct vision cystoscopy does not give good results in stout patients. In some instances, I have been compelled to prescribe a preliminary reduction cure before I was enabled to bring about dilatation of the bladder in the inclined position.

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[2]Weinrich: L'Extirpation endovésicale des tumeurs de la vessie au moyen du cystoscope opérateur de Nitze, Tr. Assn. franç. d'Urol., 1905, p. 148.
[3]Marion: Presse méd., 1910, p. 961.

2. **Galvanocauterization with the Direct Vision Cystoscope.**— Galvanocauterization of vesical tumors directly under the eye without the interposition of an optical apparatus and through a tube introduced through the natural passages, was first employed by Grünfeld, of Vienna, with very primitive instruments. But this author has paved the way to an extremely interesting therapeutic method; unfortunately it is not sufficiently well known, nor is it used frequently enough, but it deserves the full attention of urologists because of its simplicity and efficiency.

These very qualities of simplicity and efficiency attracted my attention, and I adopted this method nearly ten years ago; I believe I have made it really practical by the perfection of the technic which I have brought about. The direct vision cystoscope makes galvanocauterization of bladder tumors both simple and efficacious. With this method, owing to modern improvements, the manipulations made directly under the eye are carried out with absolute precision. The operation is performed in an air medium and the degree of cauterization thus obtained is much stronger, more precise and more thorough and the duration of the application is naturally much shorter.

Technic of the Endovesical Treatment of Bladder Tumors With Luys' Operating Cystoscope

Before proceeding to the endovesical treatment proper, it is well if one is not particularly versed in the use of the direct vision instrument, to begin by examining the bladder carefully with an indirect cystoscope. The latter, having a large visual field, makes it possible to find the tumors easily and to obtain an exact general outline of the growth. After emptying the bladder completely with a catheter, the patient is placed in position with the pelvis elevated. This done, the direct vision cystoscope with its elbowed obturator is introduced; the tip of the obturator is then straightened and withdrawn. The aspiratory tube of the cystoscope is put in operation and the lamp introduced and lighted.

Following the indications found previously by the inspection of the bladder mucosa with the indirect cystoscope, we proceed directly to the places where the tumors are located. The cystoscope is advanced directly upon the tumor itself. With the left hand holding the cystoscope steadily in position, the right hand introduces the thermocautery and places it in contact with the vesical tumor. The current is then turned on and the tumor is seen burning under our eyes. The fumes resulting from the burning are quickly evacuated by the air current which is maintained by the continuous action of the water pump.

In the case of papillomata, the tumor often becomes attached to the galvanocautery as soon as the platinum wire begins to get red. It presents a picture resembling the arms of an octopus clasping the wire. Then we feel that the extremity of the cautery which is wedged in at first, has suddenly acquired a certain freedom of movement, and if the cautery is withdrawn by stopping the current, it will be found that the instrument is covered with papillomata, which can be burned easily in the free air and thus destroyed in the simplest manner.

It is to be noted that vesical tumors are absolutely insensitive and that the patient feels no pain whatever under the action of the burning platinum wire. When, however, the base of the tumor has been reached, the patient feels a distinct burning sensation. This is an important indication to stop the cauterization and thus avoid possible perforation of the bladder.

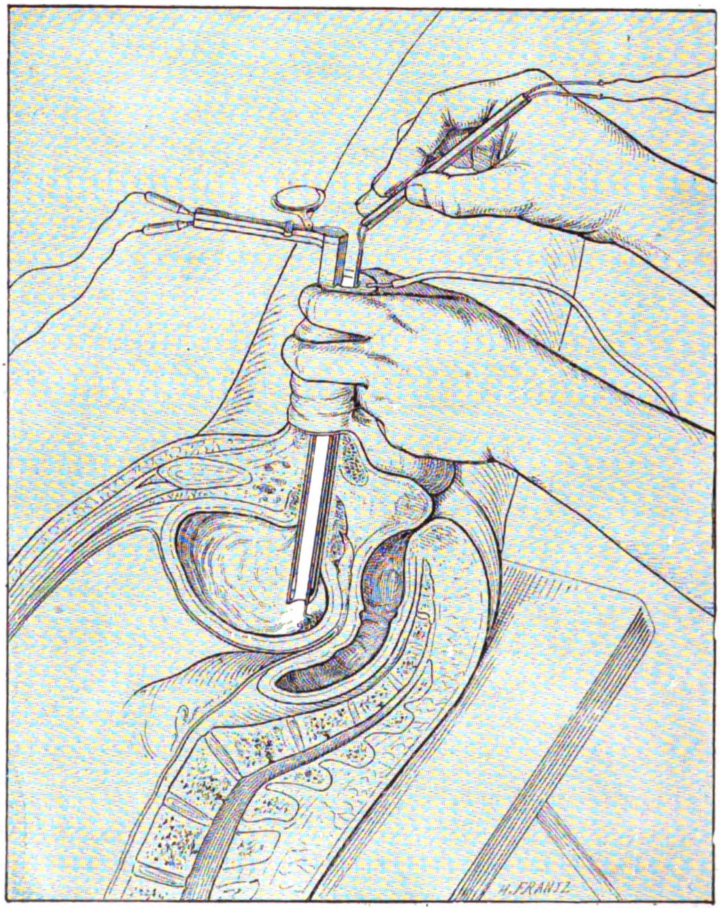

Fig. 200.—Destruction by burning of a bladder tumor through the natural passages, done under control of the eye, with Luys' direct vision cystoscope.

By operating in this manner all possible complications can be avoided. At present I am using the galvanocautery only, having given up completely the use of forceps, which may cause hemorrhage while removing pieces of the tumor. The use of the galvanocautery handled carefully, renders the destruction of vesical tumors thorough and certain, and seems to be absolutely devoid of danger.

The treatment is concluded by returning the patient to the hori-

zontal position, the instrument is withdrawn, the bladder is washed with warm boric solution and a rest of one or two days is ordered, although this is not absolutely necessary.

Advantages of Endovesical Treatment of Bladder Tumors With Luys' Operating Cystoscope

1. The advantages of the endovesical method over the suprapubic are numerous. First of all, it is safe. Not only is the operative danger practically nil, but better still, patients do not have to undergo the inconvenience of general anesthesia, nor the prolonged stay in bed after operation. The treatment can be easily applied in the surgeon's office, without anesthesia, and the patient goes home after the treatment without any risk of danger; he also continues his occupation during the entire period of his treatment. For tumors of the bladder, this operation is similar to lithotrity in vesical calculi.

Secondly, it is highly efficacious. Speaking of the endovesical operation, Weinrich states it well when he says, "It is more radical than the suprapubic." This is an incontestable fact although it looks surprising. It is well known that papillomata are often multiple and of small size. When the suprapubic operation is performed, a papillomatous mass of fairly large size can be easily recognized; but the small growths may be hard to distinguish, because they hide themselves in the folds of the shriveled mucosa, so that the most careful and watchful surgeon is liable to close the bladder without having touched these small neoplasms, which will eventually develop and cause recurrences. With the cystoscope the examining eye can see a well-stretched bladder wall, and no vesical tumor, however small, can escape observation.

Finally, the facility with which the endovesical operation can be repeated, makes the treatment of tumor recurrences quite easy. The frequency of these recurrences, especially the papillomata, is well known; under these conditions it is manifestly impossible to propose a repetition of suprapubic section at very short intervals. In cancer this fact is still more important as the constant recurrence of this affection makes the endovesical treatment preferable.

2. The advantages of my direct vision cystoscope over Nitze's operative cystoscope and the instruments similar to it, in the treatment of vesical tumors, are the following:

It is very easily handled. With my cystoscope the images are direct and not inverted, so that the surgeon's eye does not require special training to manipulate the hand and the cautery.

PLATE XXII

FIG. 1.—*Tumor of the roof of the bladder neck; bell-clapper appearance.* This tumor, seen with the direct vision cystoscope, moved forward and backward under the influence of respiration, like the movement of a bell-clapper.

FIG. 2.—*Vesical fistula* seen after a perforation of the bladder by an adjacent abscess, arising from a suppurating salpingitis; the abscess had ruptured into the bladder.

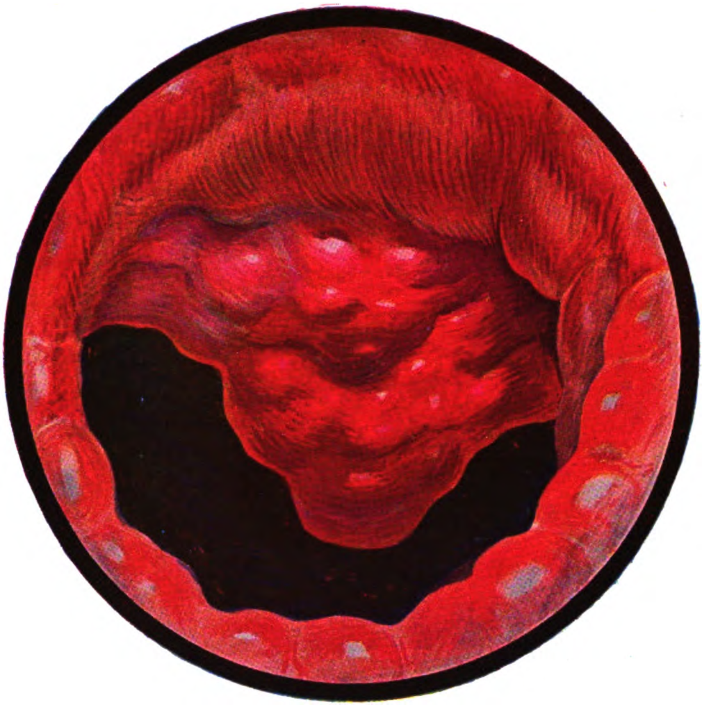

Fig. 1.

Fig. 2.

PLATE XXII

The action is more rapid and efficient. With Nitze's instrument the operation is performed under water which distends the bladder, so that the platinum wire becomes cooled by the fluid immediately, and therefore has a slower and less complete incandescence. With my cystoscope on the other hand, the operation is done in an air medium, and it can be readily seen that the cauterization will be stronger and more efficacious and for the same reason the duration of the application will naturally be much briefer.

Results of the Endovesical Treatment of Bladder Tumors

These results must be considered separately from the points of view of curative and palliative treatment. In benign tumors of the bladder, the endovesical method must be considered an absolutely and completely radical treatment. With this method the papillomatous mass can be fully isolated at the end of the cystoscopic tube and after a certain time under the action of the direct cauterization, nothing is left but a well-defined, bloodless, and shining scar at the former site of the raspberry-like tumor. Thus it can be said truthfully that a useful and complete surgical task has been accomplished.

With my direct vision cystoscope all parts of the bladder are easily accessible; to reach the fundus, the handle of the instrument is elevated; for the right wall, the handle is pushed toward the left, and for the left wall, to the right.

In cases of recurrent papilloma of the bladder which have come under my observation, the recurrence has never been seen at the site of the cauterization, thus proving the efficiency of this method of treatment. In a case reported (Case 13)[1] the complete success resulting from this treatment was verified by cystoscopy performed three times by a colleague; there was no recurrence. In another case (Case 3) complete success was not obtained because the papillomata reproduced themselves in the form of seeds all over the bladder, but recurrence never appeared at the spots that had been cauterized. This case is still more interesting because the recurrence took place after a suprapubic section. In Case 9, direct cauterization immediately and completely stopped the very copious hemorrhages; these did not return for two years afterward. In Cases 12 and 14, the patients unfortunately could not be traced; but the direct cautery immediately stopped the bleeding in these cases.

The following histories of cases are particularly instructive, because they show the undeniable necessity and efficiency of the endovesical treatment:

CASE 1.—*Recurrent Papillomata of the Bladder Treated by the Endovesical Method.* M. S., male, aged forty-nine years, referred to me July 21, 1904, by my professor, Broca. The patient complained of considerable hematuria, paleness and generally weakened condition. This hematuria had occurred four times in one year; each time it had lasted from two to six days, stopping spontaneously after rest and milk diet. The hematuria for which he decided to have a consultation, had lasted four days. I first examined the bladder with the ordinary indirect cystoscope and discovered the presence of a small tumor, the size

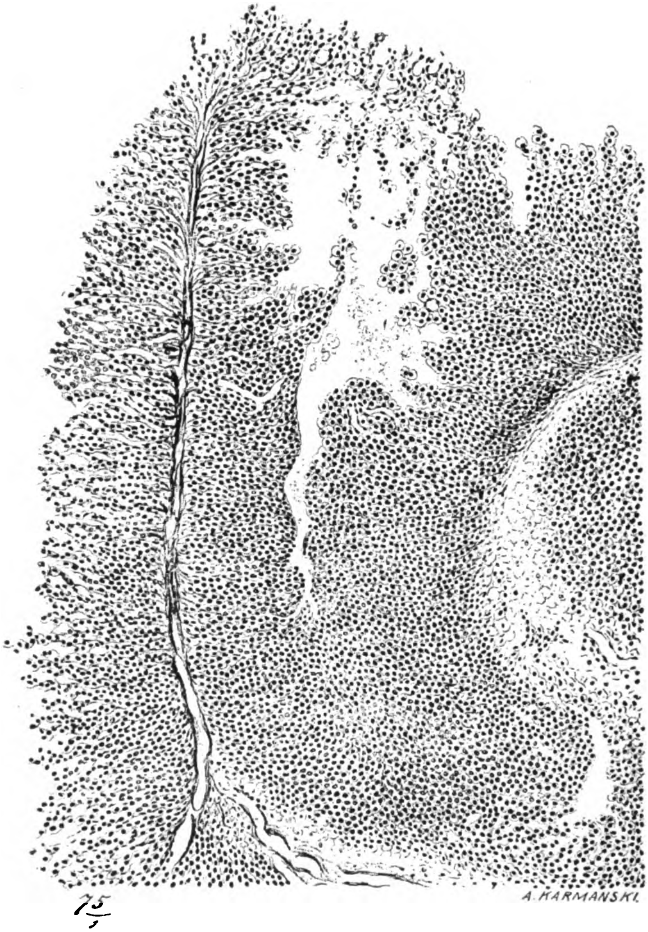

Fig. 201.—Vesical papilloma; microscopic section.

of a large strawberry situated at the bladder fundus near the right ureteral orifice and slightly overlapping it. The rest of the bladder was perfectly normal.

In view of the lesion being so limited, the suprapubic operation was decided upon. It was performed on July 26 by Broca, with my assistance. The extracted tumor was examined histologically at the faculty's laboratory of pathologic anatomy, by Decloux. The accompanying illustration (Fig. 201) which is an exact reproduction of a section of the tumor, shows a typical papilloma.

The subsequent operative procedures were very simple. The bladder was quickly

closed, the urine became perfectly clear, and the patient quit the hospital shortly afterward, apparently cured.

He remained in this satisfactory condition with clear urine and perfect general health, exactly one year. On July 22, 1905, he returned, complaining of slightly bloody urine, for three weeks past. Examination with the ordinary indirect cystoscope revealed the presence of three small papillomatous bodies the size of small strawberries, situated on the right wall of the bladder. At the site of the original tumor a distinct white scar was seen; there was no recurrence at that point. The hematuria being slight, the patient refused treatment, remaining with the slight bleeding till October, 1905. At that time, on the advice of Broca, he asked me to treat him locally through the natural passage.

The first application with my direct vision cystoscope was made October 27. The small papillomata were clearly distinguished; the fringes of each little tumor had the form of balls of twine. One of these masses was isolated, brought to the opening of the cystoscopic tube and burned with the galvanocautery. The point of the cautery that I used at that time was very thin and narrow and did not allow much cauterization. At this first operation, the patient suffered no pain whatever; the second day he went about his usual occupation. On the following days he noticed that small pieces of burned tumor were being eliminated with his urine; he brought some of the pieces to me.

On November 6, at a second application of multiple cauterization, a few detached pieces were extracted with a special toothed forceps, this being followed by a slight hemorrhage which was soon under control. Copious vesical irrigations with a warm boric solution and antipyrin, completely stopped the oozing of blood and the patient went home without difficulty. For two days subsequently the patient had some hematuria, which kept him in his bed. Blood clots formed in the bladder, which were aspirated through a large metallic tube. Soon the hematuria stopped completely, the urine became clear and remained so.

It is worth noting that the postoperative hematuria was undoubtedly due to the traction of the forceps and not to the galvanocautery. Since that time, I have abandoned the use of the forceps completely. A third examination showed only two papillomata left; they were also destroyed by the cautery.

The patient remained in excellent condition with clear urine and no trace of blood for many months. In February, 1906, desiring to verify his condition, although in good health, I examined his bladder with the indirect cystoscope, and found a new crop of small papillomata. These did not recur in the cauterized places, but were spread about like seeds in various parts of the bladder. Some were like a pin head, others a little larger like grains of hemp seed; the latter were situated on the superior part of the bladder neck, adjacent to the base of the prostate. They were burned with an improved model galvanocautery.

The cauterization of these papillomata situated on the superior aspect of the bladder neck was facilitated by instructing the patient to make pressure on the upper bladder wall with his hand; thus the tumors were pushed into the cystoscopic tube, making their destruction extremely simple. To determine the result obtained after burning, the patient relaxes the vesical wall and the scars are examined in profile.

The patient remained in perfect health with clear urine for more than five months. In November, 1906, he came back for examination although he was without any morbid symptom. I found another proliferation in spots not treated before. These also were cauterized in the same way. In February, 1907, still another examination was made, with additional cauterization of new growths. The general and local conditions continue satisfactory. I see the patient regularly once a year.

In point of fact, the patient has not seen any further blood in his urine since the endovesical treatment was begun, a period of more than ten years, in spite of continuous recurrences of the papillomata in various spots. This is due to the fact that the endovesical treatment prevented the development of the papillomata and their subsequent hemorrhages. Finally, a detail which might be interesting in a general way; in August, 1907, this patient's daughter consulted me for a small papilloma of the face, which I burned at once with the galvanocautery.

CASE 2.—*Tumor of the Bladder Treated Endovesically.* Mrs. M., aged sixty-five years, referred to me by Broca, in May, 1907, for severe hematuria. The patient had slight bleeding attacks for three years. She decided to seek medical advice because her health was being jeopardized. When I first saw her, the urine was extremely bloody, so that indirect cystoscopy was impossible. In spite of repeated irrigations and washings, a distinct view could not be obtained. On the other hand, using my direct vision cystoscope, I immediately found a tumor the size of a walnut, parts of which were necrotic. It was situated in the median line of the bladder fundus, stretching toward the left lateral wall. The right lateral wall was perfectly normal. I cauterized the tumor in three different sittings, with truly remarkable results. The hematuria stopped completely, the urine became absolutely clear, and the frequency in urination, which before my intervention was hourly by day and every two hours at night, was perceptibly ameliorated. Subsequent to June 7, she urinated only every three hours during the day, and not at all during the night. The vesical capacity at the beginning only 80 c.c. was increased to 200 c.c.

Finally, the general condition which was almost cachetic, improved rapidly, and the patient was enabled to attend to her usual duties without undue fatigue. I saw her again in September, 1907, and found that she was maintaining her excellent health. Cystoscopy at that time revealed a small recurrent tumor the size of a pea situated at the site of the former growth. This was immediately cauterized with the galvanocautery.

As in the former case, I advised the patient to come for examination every six months, so as to prevent possible hemorrhages caused by proliferations of the tumor.

CASE 3.—*Tumor of the Bladder Treated by Galvanocautery through the Direct Vision Cystoscope.* Mrs. S., aged sixty-eight years, referred by Stora, October 19, 1910. She complained of passing dark and bloody urine occasionally, sometimes of a blackish color. Cystoscopy showed a normal bladder, but behind the left ureteral orifice a raspberry-like tumor the size of a cherry was revealed, which was evidently a papilloma. All trace of this growth disappeared completely after three cauterizations through my direct vision cystoscope.

CASE 4.—*Papilloma of the Bladder Treated by Galvanocautery Through the Direct Vision Cystoscope.* Mrs. C., aged twenty-seven years, referred to the genito-urinary clinic of Broca Hospital, by Robineau, March 8, 1912. The patient complained of intermittent attacks of pain in the left kidney region; her left kidney was lower than normal and the urine was cloudy. Robineau thought of a left pyonephrosis, and wanted me to make an examination of the separate urines of both kidneys. When I cystoscoped her, on March 8, I was greatly surprised to find a tumor of the bladder with the typical aspect of a papilloma situated near the left ureteral orifice. It is highly probable that this villous tumor was pressing upon the left ureteral orifice so that it caused a difficulty in the evacuation of the left ureter and kidney, and to a certain extent caused the pains in the left kidney.

I cauterized the tumor with my cystoscope three times; i. e., on March 15, 23, and 30. The growth disappeared entirely after this intervention. This tumor is well illustrated as it appeared when first examined on March 8, in Plate IX, Fig. 4. In Plate IX, Fig. 2, the same tumor is shown as it appeared after the first cauterization.

I saw this patient again a year later, that is, May 30, 1913. At that time, she complained of cloudy urine and was anxious to know whether the vesical tumor had recurred. The examination showed that she was suffering from a gonorrhea which she had contracted from her husband. The external orifice of the urethra was extremely edematous; the cloudy urine was due to a purulent urethral discharge, the fundus of the bladder was inflamed; besides, she had a severe bartholinitis. Antigonorrheal treatment was instituted and after the acute stage had passed, I examined her (June 6), but did not find any trace of the vesical tumor. Another cystoscopic examination in February, 1914 (two years after the first treatment) showed no trace of any lesion.

CASE 5.—*Tumor of the Superior Wall of the Bladder Neck Treated With the Direct Vision Cystoscope.* Mrs. B., aged forty-one years, was seen on June 13, 1913, at the urinary clinic of Broca Hospital. She complained of cloudy urine and frequency of urination both

by day and night. On examination the bladder capacity was found reduced to about 100 c.c. The urethra was small and fibrous and this made the passage of the cystoscope quite difficult.

However, the instrument was introduced and it was found that she had a severe generalized cystitis. But while the cystoscopic tube was being withdrawn, a tumor was seen immediately behind the neck, hanging from the superior wall and acting like a valve to the extremity of the tube. The growth disappeared completely after two applications of the galvanocautery. The tumor is well illustrated in Plate XXII, Fig. 1.

Subsequently she was treated with renal lavage for a left pyonephrosis. I examined her again seven months later and found no trace of the tumor. The report of these cases shows conclusively the value of galvanocauterization with my direct vision cystoscope.

The following case of vesical tumor destroyed through the natural passages[2] was reported by Caspari, of Lausanne:

"I would like to call attention to a very simple instrument that I have found very useful; i. e., Luys' Direct Vision Cystoscope. I have used it with considerable success in the following case:

"Mrs. M., aged forty-six years. Menstruation ceased in September, 1905. On the morning of August 10, she became frightened at the appearance of a large quantity of blood in the urine. She had "lost her blood," as she termed it, two years previously. An eminent gynecologist was consulted but could not determine the source of the hemorrhage, as it had ceased when she came to him for advice. An 'exploratory' curettage was proposed, but not accepted. In the present instance the blood came during micturition. Nothing abnormal was found in the genital tract. I cystoscoped the patient in the afternoon of the same day, using the indirect cystoscope. There was no hemorrhage at that time, the urine being perfectly clear. I immediately found a papillomatous tumor on the left lateral side of the bladder fundus.

"It began at the left ureteral orifice, which was obscured by a few villi, and extended thence outward and backward nearly four centimeters from this orifice. It was as large as two big superimposed raspberries. It was shaped like a mushroom the cap of which was oval and its surface uneven with well-marked villosities floating in the fluid like the arms of an octopus. The pedicle of the tumor, hidden behind the mass, was rather imagined than actually seen. It was, in fact, elongated from within outward and anteroposteriorly; the mass was oval like the surface but its dimensions were much smaller. The rest of the bladder was normal. I photographed the neoplasm with the photographic cystoscope, but the resulting picture was unfit for reproduction.

"The tumor being well localized and isolated, and undoubtedly papillomatous and benign, I decided to destroy it with Luys' cystoscope through the natural passages. The result was complete and perfect after three applications at various intervals. The patient was cured without any complications whatever. She did not stay in the hospital, but attended to her usual occupation and enjoyed all the pleasures to which she was accustomed. Eighteen days after the second cauterization, I made a control cystoscopic examination with the indirect cystoscope. The following was noted:

"The tumor has disappeared completely, except a small round granulation situated at the external extremity of the surface occupied formerly by the tumor. This region itself can hardly be distinguished from the rest of the vesical mucosa; there is a very slight cicatricial appearance in the form of a line corresponding to the original insertion of the neoplasm. This line, starting from the ureteral orifice extends outward and slightly backward up to the above mentioned granulation. As a precaution I cauterized this granulation also.

"Cystoscopic examination, a week later, showed that the tumor did not exist any longer; the original site was represented only by a darker coloration of the mucosa. The technic employed was the one described by Luys."

[The editor has assumed the responsibility of omitting the rest of this report, inasmuch as it is an exact repetition of the author's discussion on the technic advocated by him in the treatment of vesical tumors. Caspari's conclusion follows.—EDITOR.]

"The endovesical method seems to be the method of choice when we have to deal with benign tumors of the bladder, of small size and not very numerous; also for the frequent recurrences of these tumors. In the female, Luys' method must certainly be given preference because of the excellent results obtained. I am happy to be able to assist in making it better known, having been the first to cure a case in Switzerland with this method."

In addition to these very characteristic histories, we may cite also the interesting work upon the same subject by Tixier and Gauthier, of Lyons.[3] There are also two interesting reports by de Keersmaecker, of Antwerp,[4] on the extirpation of bladder polypi through the cystoscope.

CONTRAINDICATIONS TO THE ENDOVESICAL TREATMENT OF BLADDER TUMORS

If endovesical cauterization is the method of choice for all small tumors of the bladder, and especially papillomata, I must say it can not be considered a radical treatment in the large and malignant tumors with wide and infiltrated bases; also in obese patients in whom the distention of the bladder can not be obtained on account of the considerable abdominal plethora. In these cases, Nitze's operating cystoscope should be used.

In conclusion, the endovesical treatment of bladder tumors with my direct vision cystoscope is to be recommended, for its remarkable efficiency and benign character.[5] Up to the present time, I have made over fifty applications of this method in men and women, in some cases often repeated, without a single untoward incident.

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2Communication to the Vaudoise Medical Society, meeting of Dec. 4, 1909, also La Clinique, 1910, p. 25.
3Tixier and Gauthier: Société des Sciences médicales, June, 1911.
4De Keersmaecker: Société belge d'Urologie, June, 1905.
5Caspari: Traitement des tumeurs de la vessie, La Clinique, 1910, p. 25.

TREATMENT OF BLADDER TUMORS WITH THE COLD OR HOT SNARE

This method of treatment was employed by Nitze, as previously stated; but he used this method only as a preliminary step in the galvanocauterization of bladder tumors; he snared the tumor first and then he cauterized the pedicle.

The method of Blum, of Vienna,[1] is entirely different. This author

has published a series of interesting reports on his method, which has given splendid results.[2] Nitze's instrument consisted essentially of a rigid system, which differs completely from the flexible system proposed by Blum.

Other authors, preceding Blum, like Schlagintweit, Frank, and Bohme,[3] had conceived the idea of using the catheterizing cystoscope as an operating instrument, but Blum was the first to devise a practical apparatus, which thus opened a new pathway to endovesical operations.

Blum's instrument can be introduced into the catheterizing cystoscope in the same way as a ureteral catheter. To point the snare toward different portions of the bladder, he utilizes Albarran's deflector. The essential element of Blum's instrument is a snare enveloped by a

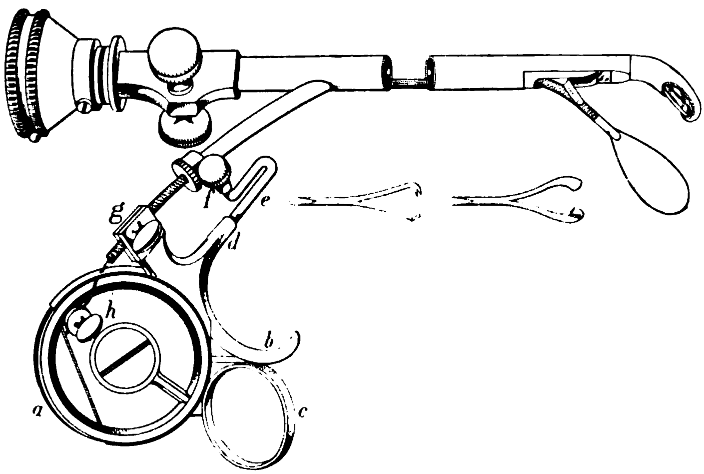

Fig. 202.—Blum's operating cystoscope.

flexible metallic sheet, which can be introduced in its entirety into the channel provided for the ureteral catheter in the catheterizing cystoscope.

Blum's operating instrument (Fig. 202) is composed of a steel spring 1.8 mm. wide, corresponding in caliber to a No. 6 Charrière. This is the conducting channel for all the instruments. This spring of steel, very flexible and free, has a solid, straight end that is strong enough to resist pressure upon any part of the vesical mucosa, as for instance, the base of the tumor. The spring has an eye at its vesical end, to which a bronze aluminum wire is attached; the other extremity is attached to the end of the obturator which can be inserted or withdrawn within the lumen of the spiral in order to enlarge or diminish the snare.

PLATE XXIII

Fig. 1.—*Edematous aspect of a ureteral orifice;* undoubtedly indicating a diseased condition of the ureter or of the corresponding kidney.

Fig. 2.—*Edema of the ureteral orifice* observed in connection with a ureteral calculus.

Fig. 1.

Fig. 2.

PLATE XXIII

The caliber of the external extremity of the spring is sufficient to allow the steel obturator to completely close its lumen. The internal extremity has a semilunar groove in which the snare is fully lodged when reduced to its minimum size.

The manipulation of this instrument is facilitated by the use of Leiter's drum handle; this has a flat spring, over the external extremity of which the obturator is rolled. The plain snare can be replaced by a forceps which is operated by the obturator and the drum handle. Zuckerkandl, of Vienna, has devised a special cautery which can be attached to this instrument; it aids in the cauterization of the base of the tumors.

Preparation of the Patient.—Blum anesthetizes the anterior and posterior portions of the urethra with three or four c.c. of a 5 per cent solution of novocaine. Sometimes in sensitive patients he injects hypodermatically two c.c. of morphine, or he gives the patient an antipyrin irrigation. After the bladder is emptied, he instills five c.c. of a 1:1000 solution of adrenalin, to prevent bleeding. (This dose of adrenalin seems quite strong and dangerous.) Finally, to obtain the clearest possible vision, the bladder is filled with 250 to 300 c.c. of sterile water.

The quantity of water to be injected varies according to the individual. Blum has noticed that in tumors on the roof of the bladder or on the anterior wall, it is advisable to inject a smaller quantity of water, so as to bring the cystoscope to a more convenient distance. Thus in a man eighty years old, with a papilloma on the roof of the bladder, he employed the following procedure: With 150 c.c. of water in the bladder, the tumor was so far away that he could not grasp it with the snare. He then opened the snare so widely that the largest circumference of the tumor could easily be enclosed by it. Then he gradually emptied the bladder till thirty or forty c.c. remained. In this way, the vesical tumor descended spontaneously into the snare and was thus extirpated.

Preparation of the Instrument.—The operating instruments are attached to Nitze's catheterizing cystoscope. The bronze aluminum wire constituting the snare is pulled so that it assumes the shape of the letter *U*, one centimeter in length; this is completely hidden in the concavity of Albarran's deflector. The instrument is now introduced into the bladder.

Operating Technic.—When the tumor appears in the visual field, the spiral spring is pushed inward until its extremity is seen; then the loop is formed in a circle, the diameter of which should be a little larger than the greatest circumference of the tumor. The spring is so manipulated that the loop is perpendicular to the length of the tumor.

With the aid of Albarran's deflector, the loop is brought around the tumor and the spring is pushed toward the vesical wall so that it presses upon the normal vesical mucosa.

When the loop is at the base of the growth, the obturator is pulled forcibly. During this maneuver a sensation of crackling of the destroyed tissues is often felt. It is important to make sure that the loop is firmly attached to the pedicle, for then the tumor will follow all the movements of the spiral.

After fixation is thus secured, the cystoscope is withdrawn leaving the spiral and the snare in the same manner that a ureteral catheter is left in the ureter. The snare is left in this position for 24, 36, or 48 hours, when it usually comes out spontaneously. Shortly thereafter the patient generally passes the entire tumor with the first micturition.

It is well not to cystoscope the patient for eight to fourteen days after this operation, on account of possible hemorrhages. But if it is done, an ulceration will be seen at the site of the former growth, in the form of a crescent covered by necrotic tissue. Fifteen days after operation the eschar usually comes out spontaneously, accompanied by a slight hemorrhage. In this way, the destruction of the tumor is attained at one sitting without the loss of a drop of blood. This is certainly an ideal technic for a simple operation; but often certain difficulties are encountered.

The operative difficulties, are the following: First the tumor can not be grasped as above described. In this case the double catheterizing cystoscope should be used. The spiral and snare are passed into one of the channels, and a toothed-forceps into the other. The forceps grasps the tumor and the snare is worked around the growth as close to the base as is possible.

Other difficulties are due to the indirect cystoscope itself, the principal being that the vesical fluid becomes cloudy. Finally, serious hemorrhages are always to be feared, particularly when the eschar separates and comes away.

Operative Results.—Blum has operated on 44 bladder tumors of which 37 were papillomata. In one case he was compelled to resort to suprapubic cystotomy because of a very dangerous hemorrhage which followed the separation of the eschar. (This occurred eight or fifteen days after the endovesical operation, while the operator was cystoscoping the patient in order to verify the result.) In all the other cases the endovesical operation was successful. Two cases recurred and were again operated on in the same way. Blum prefers the cold snare because the hot snare might burn and perforate the bladder wall.

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Electrocoagulation of Tumors of the Bladder

The treatment of bladder tumors by electrocoagulation has been utilized because of the splendid results obtained with this method in tumors on accessible parts of the body, by Doyen[1] in France, Berndt, in Austria, and Nagelschmidt[2] in Germany. Doyen[3] first makes a suprapubic incision and through this opening in the bladder he applies electrocoagulation to the tumor.

Edwin Beer[4] of New York, in 1910, conceived the idea of applying electrocoagulation to bladder tumors through the natural channels. He used the indirect cystoscope. A number of Americans shortly afterward published cases confirming the value of this method.

Among the most noted publications may be mentioned those of Buerger and Wolbarst,[5] Gardner,[6] Sinclair,[7] McCarthy,[8] Judd,[9] Harpster,[10] Binney,[11] Watson,[12] Pilcher,[13] and Barney.[14] Reports have also been published by Bachrach,[15] in Austria, Kuttner,[16] Bucky and Frank,[17] in Germany, and in France by Legueu,[18] Heitz-Boyer and Cottenot,[19] André[20] and Lepoutre and d'Halluin.[21]

Electrocoagulation is produced by high-frequency currents of *low* tension; while the spark produced by the high-frequency current and *high* tension which constitutes "fulguration," exerts but a superficial action, and no effect deeper than three or four mm. Doyen has demonstrated that with the high-frequency spark and *low* tension, electrocoagulation can be obtained in the substance of the tissues to a depth of fifteen to twenty mm.

The current necessary for electrocoagulation is secured through a special current transformer (Fig. 203). This apparatus is composed of a transformer which changes the street current with its high voltage running up to several million volts. This current passes into Oudin's resonator; a third part regulates the intensity of the current.

Sparking is not absolutely essential for electrocoagulation. If instead of leaving a gap between the electrode and the tumor, the two are brought into direct contact, coagulation will be produced without carbonization, because its action is not due to the heat alone.

When the electric current is not very strong, and it is used with very large electrodes having equal surfaces, "diathermia" or "thermopenetration" is produced; this simply produces a sensation of heat.

When a stronger current is used and the electrodes have a very much smaller surface, the albuminoid matter is coagulated and we have "electrocoagulation."

To produce the maximum effect two electrodes are required, one being very large and wide and the other very small. A sensation of heat will be produced near the large electrode, because the heat is spread over a large surface; on the other hand, the maximum electrocoagulation will be obtained near the small electrode. In practice, the wide indifferent electrode consists of a sheet of tinfoil placed under the buttocks of the patient, and the small active electrode is introduced into the bladder in direct contact with the tumor.

The small electrode consists of a perfectly insulated copper wire

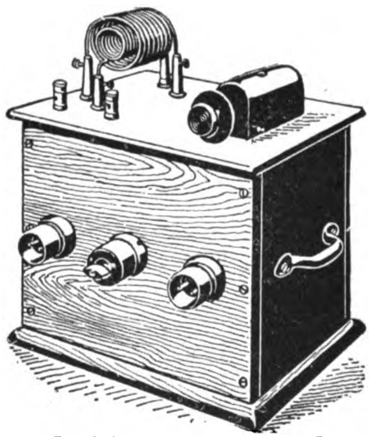

Fig. 203.—Current transformer for electrocoagulation.

having a copper tip at its end, which comes into contact with the growth. Its caliber is not quite that of a ureteral catheter, being easily passed into a catheterizing cystoscope and much more easily into a direct vision cystoscope.

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[19]Heitz-Boyer and Cottenot: Assn. d'urol., 1911, p. 774.
[20]André: Assn. franç. d'urol., Oct., 1913, p. 736.
[21]Lepoutre and d'Halluin: Rev. clin. d'urol., Jan., 1914, p. 35.

Operative Technic.—The technic will vary according to whether the indirect or direct cystoscope is used.

1. WITH THE INDIRECT METHOD.—The patient is placed in the usual position for indirect cystoscopy. The bladder is filled with 200 c.c. of sterile water and the electrode is introduced in the same manner as a ureteral catheter, under control of the eye, and brought into direct contact with the tumor. The current is turned on for fifteen to thirty seconds, at each application; the changes produced by the action of the current are kept under close watch all the time. At first gas bubbles will appear, then the tumor will show a black central zone surrounded by a whitish coagulated area.

Generally the treatment must be interrupted because the vesical fluid soon becomes cloudy. In this case the cystoscope is withdrawn and the patient is instructed to urinate; considerable broken-down debris of the coagulated tumor will be found in the urine thus passed. [In the improved American cystoscopes, cleansing of the bladder is accomplished by merely removing the telescope and irrigating the bladder through the cystoscopic tube, which remains undisturbed throughout the treatment.—EDITOR.]

2. WITH THE DIRECT METHOD.—In general, the technic is the same as that in direct vision cystoscopy. The patient is placed in the inclined position, a large indifferent electrode is placed under the buttocks, the cystoscopic tube and the lamp are introduced and the small electrode is directed upon the tumor.

There is a decided difference in the application of electrocoagulation between the two instruments, the direct vision method having distinct advantages. The fluid distending the bladder will offer greater resistance to the current than that offered by the air, as in the direct vision method. Furthermore, the electricity will produce a certain amount of decomposition of the water, which is made evident by the escape of gas bubbles and by numerous small explosions during the

coagulation. According to some authors, these explosions are of no consequence; nevertheless, although the patient is not aware of them, they impair the clear view of the operator to some extent at least.

With the direct cystoscope, the technic is therefore much more simplified because these water inconveniences are not present in the air medium. With this instrument, a tumor of the bladder may be considered outside of the body, and can therefore be treated like any other tumor of the cutaneous surface.

Certain precautions are necessary, however, when this instrument is used. First, the tumor surface must be thoroughly anesthetized, by the application of tampons soaked in a 10 per cent solution of stovaine. After a few moments the active electrode may be safely applied, providing, however, that only weak currents are employed. When the current is too strong, the patient will suffer pain and moves about uneasily, so that the operation can not be continued.

On the other hand, when the anesthesia is thorough and the current weak, electrocoagulation can be done painlessly, but the operation progresses slowly and the sittings must be lengthy, with little to be done at each sitting. With patience, however, the results obtained are worth while. In particular, there is no bleeding. The electrocoagulation produces a very white eschar which penetrates deeply, and the base of the tumor can be attacked safely without fear of injury to the bladder wall.

It can thus be seen that a large tumor can not be destroyed in one sitting. It is better by far to employ repeated sittings to insure its complete destruction.

Recently I used this method in a female patient at Broca Hospital, in the service of Jeanselme. She complained of cloudy urine. Cystoscopy revealed a tumor (Fig. 204). Electrocoagulation was performed with my direct vision cystoscope, under most favorable conditions. The changes and final results of the treatment are well shown in Figs. 205, 206, 207, and 208.

Comparative Value of Electrocoagulation and Galvanocauterization

Unfortunately the comparative therapeutic value of these two methods has not yet been sufficiently studied, and it is interesting to consider which procedure is to be preferred.

Advantages of Galvanocauterization.—1. It is simple. The use of the cautery is very simple. A galvanic current can be provided easily in any surgical equipment. The manipulation of the current is

Fig. 204.—View of a bladder tumor situated in median line of the trigone,—before treatment.

so simple, so convenient, that it constitutes an ideally simple therapeutic agent.

2. It is safe. The galvanocautery is so thoroughly under con-

Fig. 205.—Same as Fig. 204. First application of electrocoagulation. With the direct vision cystoscope, the excavation made by the burning at the base of the tumor is easily seen.

Fig. 206.—Same as Fig. 204. View of the same tumor eight days after the first application of electrocoagulation. The apex of the tumor is lower and much smaller in front.

trol that it is impossible to cause injury to the bladder mucosa. Neither perforation of the bladder nor subsequent hemorrhage has ever been observed in my experience.

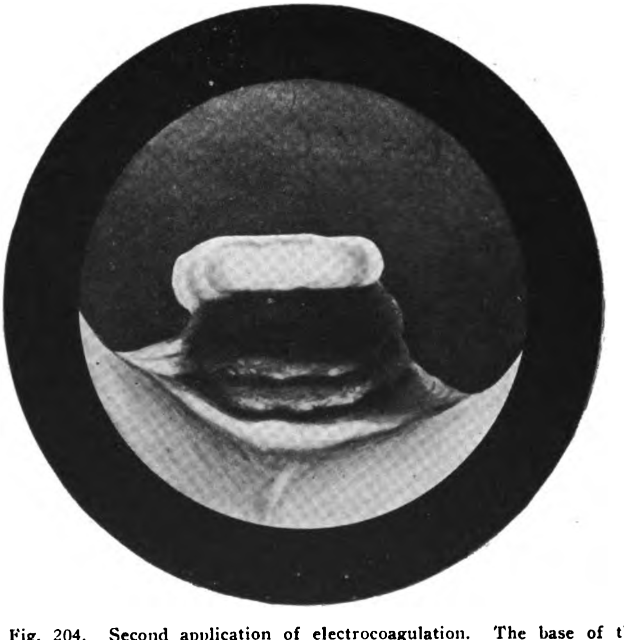

Fig. 207.—Same as Fig. 204. Second application of electrocoagulation. The base of the tumor is completely burned; its apex presents a white eschar.

3. It is painless. Galvanocauterization of bladder tumors is remarkably painless. Pain is felt only when the cautery burns the healthy mucous membrane. When pain is complained of, it is an excellent indication that the cauterization has reached the base of the tumor.

4. Its final results are perfect. Scars examined years after cauterization have always appeared smooth, soft, and regular.

5. Recurrence *in situ* has never been observed when the cauterization has been done thoroughly. The cicatrix always remains white, soft, and well defined.

Fig. 208.—Same as Fig. 204. View of the bladder fifteen days after the application of electrocoagulation. The tumor has completely disappeared; the vesical floor shows nothing but edema.

Disadvantages of Galvanocauterization.—1. The length of the treatment. It is out of the question to believe that a tumor of considerable size can be destroyed in a single sitting; repeated sessions are often necessary. But this applies just as well to electrocoagulation.

2. The action is superficial. Galvanocauterization does not penetrate deeply into the tissues. It is a "blade of fire" which destroys only that which it touches. However, this disadvantage applies only when we are dealing with a malignant tumor of the bladder. In point of fact, papillomata are superficial tumors and in the vast majority of cases galvanocauterization is perfectly able to destroy them completely and prevent their recurrence. In cancer of the bladder,

the galvanocautery is manifestly insufficient; on the other hand, the most enthusiastic supporters of electrocoagulation do not employ this method in vesical cancer.

Advantages of Electrocoagulation.—1. Electrocoagulation has a decidedly more powerful action than the cautery; it penetrates more deeply and is much more intense.

2. Electrocoagulation causes destruction of bladder tumors almcst bloodlessly. During the operation not a drop of blood is seen; it seems to have a most perfect and certain hemostatic action.

Disadvantages of Electrocoagulation.—1. It requires complicated and highly expensive instruments.

2. The dangers are many; e. g., perforation of the bladder has occurred in many cases.

3. Hemorrhage is not produced at the time of operation, but eight or ten days thereafter, when elimination of the eschar takes place; this accident has also been reported.

4. Electrocoagulation seems to me more painful than galvanocauterization. Whichever method is employed, one thing is certain: The operation is much simpler with the direct cystoscope than with the indirect.

Endovesical Treatment of Bladder Tumors by Electrolysis

Rudolph Oppenheimer, of Frankfort,[1] has proposed that papillomata of the bladder be treated by electrolysis.

Operative Technic.—The positive pole connected with a wide electrode is placed on the patient's thigh. The negative pole is introduced into the bladder by means of a No. 6 Charrière catheter, which is easily admitted by any catheterizing cystoscope. The bladder is filled with oxycyanide of mercury solution, the cystoscope is introduced, and the vesical extremity of the negative electrode is applied to the villi of the tumor down to its base. The current is then applied, care being taken not to use more than 25 to 45 milliampéres. By moving the cystoscope about in different positions, the electrode will attack various parts of the tumor.

During the operation numerous gas bubbles will be seen; these are due to the electrolysis of the vesical fluid. These air bubbles are often so numerous as to impair the operator's view. To correct this mishap the author recommends emptying the bladder and then refilling it. After the operation the patient voids fragments of the tumor of a whitish color for about ten days.

Advantages.—The principal advantages which the author claims for this method of treatment, are the following:

1. It is safe. The hemorrhage is reduced to a minimum. Often even the vesical fluid is perfectly clear after this intervention. As compared with electrocoagulation, the danger of perforation is slight.

2. It is simple. The technic is very simple and requires no complicated apparatus.

3. The Pain is Minimized.—When the cutaneous electrode causes a sensation of burning, it is relieved by interposing wet compresses. The vesical electrode is absolutely painless.

Disadvantages of Electrolysis.—First, the production of gas bubbles as a result of electrolysis of the vesical medium. This necessitates emptying and refilling the bladder. Then the treatment is of long duration; a certain case, treated by the author, required nineteen applications to bring about a cure.

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Endovesical Treatment of Bladder Tumors by Radium

This method of treatment has not yet been very fully studied, but it does not seem to me as though it were able to produce brilliant results. I have had the opportunity of using it in a case myself, but without appreciable result. The following is a report of the case:

A Case of Cancer of the Bladder Treated by Radium.[1]—A man, aged sixty-five years, father of a colleague, was referred to me by Péraire, in June, 1909. Cystoscopy revealed a lobulated tumor, the size of a cherry, without villi, with a hard and scirrhous aspect. There was no bleeding. This tumor had developed on a vesical trabeculation behind and outside of the left ureteral orifice. Both ureteral orifices were absolutely normal.

I suggested excision of a portion of the growth for microscopic examination; but the patient was very stout and his urethra was not very patent, so I began by passing sounds up to No. 60, ordering a fat reduction cure at the same time. This treatment was followed by good results, and one month later, I was able to cystoscope him and extract a few fragments of the tumor. These fragments, examined by P. Ameuille, showed the presence of a metatypical pavement epithelioma; the report was accompanied by this opinion, "It seems to be of a very malignant type."

I suggested suprapubic cystotomy, not only to be able to remove the tumor, but also to excise part of the vesical wall; but the patient refused to give his consent. He went thus without treatment for a year. I saw him again in October, 1910; cystoscopy showed that the tumor had grown considerably and that its base was as large as a five franc piece (silver dollar). Surrounding its base was a considerable edematous area which extended to the prostate and completely obscured the left ureteral orifice. Moreover, the general condition was bad, the patient having lost fifteen pounds in two months.

In this condition, operation being considered dangerous, I proposed the application of radium. The first application was made on October 29, with the assistance of Desgrez, whose skill in radiology is well known. Two tubes of radium in an elbowed catheter No. 19, were applied to the tumor. Seven applications were made from October to December.

The duration of each treatment was about two hours, five centigrams of radium bromide being used. This in reality contained only two centigiams of radium.

Under this treatment, it was noted that there was a distinct improvement in the general condition of the patient. The hematuria disappeared, the pains diminished considerably, but cystoscopy showed that the edema surrounding the tumor was very much increased, thus doubling the size of the growth. In May, 1911, another examination showed that both tumor and its surrounding edema were progressing materially. A few months later the patient died.

It seems then that this case, studied histologically and treated well radiologically by a competent specialist, and also well treated from the cystoscopic point of view, did not benefit by the radium treatment. The only result obtained was the cessation of the hemorrhage and pains, but the application of the radium did not stop the continued development and growth of the malignant tumor.

REFERENCE

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NOTE.—The experience of American urologists with radium in the treatment of vesical cancer may be summed up in the following personal communication from Winfield Ayres, of New York, who has had considerable experience with this remedy.—EDITOR.

"After nearly four years of experimentation, I am forced to the conclusion that radium in the treatment of cancer of the bladder is not so effective as in treatment of neoplasms in other parts of the body. It has considerable action in relieving the pain, but practically none in stopping discharge or odor; and very little in arresting the progress of the disease in the majority of cases.

"The most effective method of application in a well-developed cancer is by cross irradiation from the rectum to the suprapubic region, using massive dosage—not less than 3,000 mg. hours at a sitting. For a small growth, this combined with frequent, direct applications of the beta rays under direct vision gives the most satisfactory results. Intravesical applications without visual control seem to me to be too dangerous and too haphazard.

"Cancer of the bladder should be irradiated before and after operation.

"Thorough irradiation of a papilloma not only renders such a tumor more easily removed by dessication, but diminishes the probability of its return."

CHAPTER X

TREATMENT OF FOREIGN BODIES IN THE BLADDER

Foreign bodies in the bladder are of two principal varieties; namely, actual foreign bodies and calculi.

ACTUAL FOREIGN BODIES

The untoward consequences of foreign bodies left in the bladder are very well known.[1] Calcareous salts are deposited upon them, thus acting as nuclei of vesical calculi. The objects found in the bladder are varied and often most unexpected in character. The frequency of fragments of bougies and catheters is easily explained; but it is surprising to find hair pins, beans, pencils, pen-holders, sticks of wax, needles, and even smoking pipes! It is needless to attempt to explain the purposes underlying the introduction of these objects. Once they are in the bladder, what is to be done to remove them?

First of all the presence of the foreign body must be made certain, either by an ordinary metallic searcher or better still, by the cystoscope. Their extraction is somewhat difficult. When small they can be extracted with Collin's ingenious extractor or with the lithotrite. These instruments can be used only when the foreign bodies are firm in consistency; but in a bladder that is irregular and trabeculated, it is difficult to determine whether the instrument is grasping the vesical wall, a vesical column, or a soft foreign body.

The extraction of large foreign bodies is more difficult. Long and rigid bodies not more than seven or eight centimeters in length generally lie transversely in the bladder because this diameter never varies even when the bladder is evacuated.[2] When caught in this transverse position their extraction is impossible. It then becomes necessary to change their position from transverse to anteroposterior, so that they will follow the same route that they took when introduced,—but in the opposite direction.

This can not be done blindly. When foreign bodies are to be removed through the urethra, it is evident that their rapid, certain, and safe extraction can be assured only with the cystoscope under control of the eye. Until recently, if simple means did not succeed in recovering the body, it was necessary to resort to suprapubic cystotomy.

PLATE XXIV

FIG. 1.—*Vesical tumor* photographed in color several hours after cystotomy.

FIG. 2.—*Cancer of the bladder* secondary to uterine cancer.

FIG. 3.—*Bullous edema of the bladder,* following uterine cancer in a patient in the service of Pozzi, at Broca Hospital, operated on twice for cancer of the uterine neck; after invading the vesicovaginal wall, the cancer perforated the bladder.

FIG. 4.—*Purulent ejaculation from a ureteral orifice,* in case of pyonephrosis.

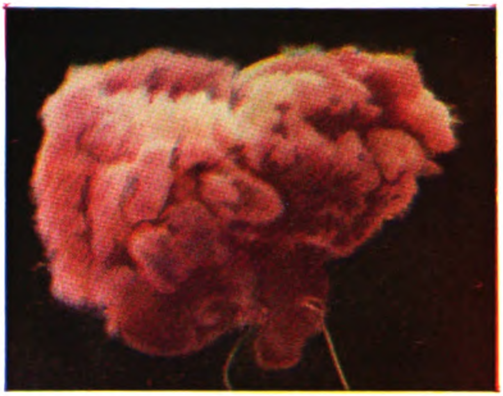

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

PLATE XXIV

However safe this method may be, in experienced hands, the remedy seems out of all proportion to the character of the trouble.

It is clear that direct vision cystoscopy[3] must be considered a valuable help in the extraction of foreign bodies from the bladder. With this method the foreign body can be seen distinctly, its exact position is determined, and it can be grasped effectively and rapidly extracted.

This is exactly what happened in the case of a woman, aged twenty-six years, who unfortunately lost a celluloid hair pin in her bladder

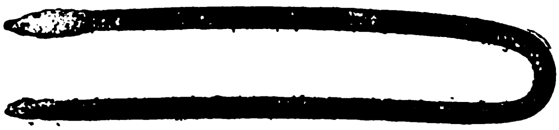

Fig. 209.—Celluloid hairpin, after having lain in the bladder nine days, extracted with the direct vision cystoscope. The ends are already encrusted with calcareous salts.

(Fig. 209). She reported her loss to Bosquette, of Montbéliard, who referred the woman to me. On February 3, 1906, she told me that the "accident" had occurred on January 25, that is, nine days previously. The pin was introduced into the urethra, convexity first, and passing through the sphincter, it fell into the bladder. Since then the patient complained of pain and frequent urination. There was no hematuria, but the urine was cloudy.

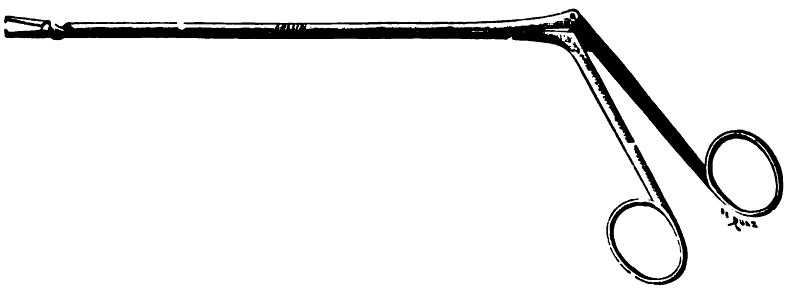

Fig. 210.—Forceps for the extraction of foreign bodies through the direct vision cystoscope.

I introduced my cystoscope easily into the bladder and the pin was seen lying in the classic transverse position. The convexity of the pin pointed to the right of the patient. To give the pin an anteroposterior position, I inclined my instrument to the right, caught the loop with a forceps (Fig. 210) introduced into the cystoscopic tube, and turning the pin, brought it around so that its convexity approached the internal orifice of the urethra. It was then very easy to withdraw the instrument together with the pin. The operation was easy and painless. The pin had followed the same route coming out as it did going in, but in

an opposite direction. The time required for the extraction did not exceed five minutes.

Examined after extraction, the pin was found to be made of celluloid, and the branches measured 7½ centimeters in length. At the points, a slight incrustation with calcareous salts could be noticed. The patient did not suffer any inconvenience and was able to take the train home the same day.

This method of extraction is extremely easy and practical for smaller bodies, like the tip of a catheter, for example. To illustrate: A woman, aged forty-seven years, was operated on, at the Charité, on August 28, 1905, by Auvray, in the service of Reclus. After the operation, it was decided to tie in a Pezzer catheter, but the extremity of the catheter broke off, while it was being introduced, and fell into the bladder. It was impossible to extract it with ordinary methods. On September 27, I used my cystoscope and extracted it without any difficulty (Fig. 211). In these cases, as in any other surgical intervention,

Fig. 211.—Fragment of a Pezzer catheter, broken off in the bladder; removed through Luys' direct vision cystoscope. (Twice the natural size.)

the rational principle of seeing the lesion before treating it, must be realized.

I had the opportunity of seeing another interesting case in the service of Pozzi, at Broca Hospital. It was in a woman who had been operated on at some other hospital for vesicovaginal fistula, silk sutures being used. After the operation, the patient complained of cloudy urine. With my cystoscope, I discovered a small, white, movable calculus in the bladder, and a silk thread situated on the side of the bladder (Plate XI, Fig. 1).

It is interesting to note that in this case, as in almost all similar cases, the silk thread which united the vesicovaginal wall, was tied on the vaginal side. It often happens, however, that the knot becomes rotated toward the bladder. This is exactly what happened in this particular case. The small, white calculus was evidently due to the presence of a piece of silk thread which remained in the bladder. The calculus was eliminated with the urine, a little later, through normal urination. The silk thread was caught at the knot with a pair of forceps and gently pulled out in its entirety.

Many interesting cases have been reported by various authors. The following are among the most important:

Boari, of Ancone, used my instrument successfully in a particularly important case. The left ureter was injured during an abdominal hysterectomy for fibroma. He introduced a No. 9 ureteral catheter into the ureter, so that its peripheral extremity entered the bladder. Then he sutured the ureter over and around the catheter. The operative sequelæ were regular and uneventful, and twelve days later Boari used my direct vision cystoscope and extracted the ureteral catheter without any difficulty.[4]

Gauthier, of Lyons, extracted a broken catheter from the bladder of a man, under local cocaine anesthesia. His report of the case follows:[5]

"X., aged forty years, entered the Hospital of Sainte-Foy-les-Lyon in the service of Gallois, on February 20, 1909. He was suffering from a syphilitic myelitis, complicated for a month past by an almost complete paraplegia and complete retention of urine. He had been catheterizing himself with a Nélaton catheter, which broke in two in the canal. The portion which remained outside was saved. On examination it consisted of a red rubber catheter No. 14, nearly 16 cm. in length. A similar catheter in perfect condition was found to be 32 cm. long; consequently the piece left in the bladder must have had a length of about 16 cm. The rubber was hard, cracked and inelastic. It had been 'baked' by time, and was easily broken in two. This fragility readily explained the accident.

"The day following his entrance into the hospital, Gallois attempted to extract the catheter with Collin's tractor, but it broke; two fragments measuring two centimeters were recovered, however. This method was not successful. My friend Gallois then invited me to examine the patient. I cystoscoped him on February 28 and found a cystitis with the cloudy and foul urine characteristic of foreign bodies in the bladder. After a copious irrigation of the bladder I tried to remove the catheter with a lithotrite with flat jaws. Anesthesia was unnecessary, for the myelitis had brought about a marked analgesia of the urethra and bladder.

"I was not any more fortunate than Gallois, because I did not remove any more than three centimeters of nonencrusted catheter, in three fragments. I did not persist, for fear of causing trauma in an already infected bladder. It was indeed very difficult to grasp the foreign body, because the sensation felt through the lithotrite was similar to that which is felt when the mucosa has been caught. I postponed cystoscopy for a few days to give the bladder a rest. In the meantime, the bladder was irrigated twice daily with a silver solution.

"On April 1, I performed indirect cystoscopy. The catheter was seen immediately, encrusted with calcareous salts, which gave it a whitish coating and thus made it easier to be seen. One end was near the roof to the right, the other was to the left of the neck. According to the law of accommodation of Guyon and Henriet, this oblique position in the vertical plane gave the foreign body more than nine centimeters of length.

"What was to be done? The usual instruments for extracting foreign bodies were fruitless, owing to the friability of the catheter. We were not encouraged to try them again, because the encrustation had increased the size of the object and made it more dangerous to the integrity of the urethral mucosa.

"We thought, naturally, of suprapubic cystotomy, or better still, of perineal section, which gave better drainage to such an infected bladder. But the patient was very much depressed, suffering from subacute myelitis, and a continual diarrhea produced by the injec-

tions of mercury biniodide. In these circumstances we were justified in hesitating before a general anesthesia and a bloody operation. So we decided to use the modern Luys' indirect vision cystoscope. In case of failure, cystotomy would be resorted to.

"Having procured the necessary instruments, I cystoscoped the patient on March 8. It was my first attempt with this instrument in the male, and I think also, it was the first time this procedure was ever attempted in Lyons. The operative steps were as follows: Copious bladder irrigations with permanganate; emptying the bladder; urethral anesthesia with cocaine (the patient having been improved by the mercury injections, had recovered the urethrovesical sensation); large sounds, about 30 Charrière were passed. They tore the meatus and caused slight bleeding; the cystoscope was introduced easily with its elbowed obturator, by depressing the pubic region, thus relaxing the suspensory ligament of the penis (Guyon's method). The obturator was withdrawn, the light introduced and the urine aspirated with the water horn; Trendelenburg position.

"The catheter was seen heavily covered by calcareous deposits, resembling a section of pipe-stem covered with white clay. It was about ten centimeters in length, as was expected. The position was the same as that observed with indirect cystoscopy.

"In order to disengage the catheter, its lower end which was the most accessible, was

Fig. 212.—View of the bladder mucosa in bullous cystitis, accompanying a foreign body in the bladder. (This cystitis covers two-thirds of the bladder.) (Le Für.)

cut across with a sharp-blade forceps. In this way several fragments were withdrawn through the urethroscopic tube. The other extremity, now movable, was also seized at its end and drawn through the tube. This fragment was six centimeters long, and its caliber, including the encrustation, was No. 22 Charrière.

"Cystoscopy then showed that there were still two small fragments in the bladder. The mucosa was very highly inflamed; small ulcerations and blackish infiltrations were seen here and there. A fetid odor came through the tube. The patient was brought to the horizontal position, and the bladder liberally irrigated with permanganate. The operation was well tolerated and thanks to the cocaine, was painless.

"The final results were satisfactory. Eight days later (March 15) the urine was less cloudy and foul, there was no fever and the tongue was moist. When all the recovered parts of the catheter had been added to the part that had been saved, we obtained a length of 31 cm., which was just one centimeter less than the perfect catheter used for comparison."

Another case is reported by Ferron.[6] A working girl, aged sixteen years, entered the service of Pousson with symptoms of severe cystitis. The patient attributed the affection to overwork, but further questioning elicited the admission that she had accidentally inserted a metallic

hairpin into the bladder. By the aid of direct vision cystoscopy, Ferron recovered the object. In this case indirect cystoscopy was impossible because of the existing cystitis.

Still another very interesting case is reported by Le Für. A woman had been subjected to a subtotal abdominal hysterectomy for a fibroma of the uterus. After the operation, the patient always complained of pains in her abdomen, and three months later, the surgeon who had operated on her, found an infiltration of the vaginal cul-de-sac, for which he advised hot vaginal douches. The pains persisted, however, in spite of these irrigations. A diagnosis of abscess of the broad ligament was made, and a vaginal incision was performed in February, 1909.

In the following August another surgeon made an abdominal incision. Meanwhile, in April, the patient had begun to complain of

Fig. 213.—Three strands of silk thread the ends of which project into the bladder. (Le Für.)
Fig. 214.—Three additional strands of thread, with a knot projecting into the bladder (magnified by the cystoscope). (Le Für.)

pain in the bladder, and in spite of the vaginal irrigations and internal treatment these pains continued to grow worse.

Le Für saw the patient the first time late in 1909. The urine was very cloudy and precipitated a thick layer of pus in the examining glass. Cystoscopy showed a very intense cystitis, which might have been mistaken for a neoplasm of the bladder. Local treatment was instituted and the cystitis improved.

A second cystoscopy revealed at least four or five masses of thread resembling silk, attached to the posterior bladder wall, and presenting a hairy appearance owing to the silk fibers. Others were covered by a whitish mucus forming a real veil; some had their ends free; in others the knot of the thread could be recognized.

Le Für used Luys' direct cystoscope and he discovered and ex-

tracted a silk loop thirty centimeters in length; he thus avoided suprapubic cystotomy and improved the patient's condition considerably. This interesting case of the removal of a silk thread of such a length (Figs. 213-214) and its extraction through my cystoscope, indicate conclusively the great benefits that can be derived from the recent improvements in the technical instrumentation in cystoscopy. As Le Für well states it, "direct vision cystoscopy has succeeded where all other exploratory procedures have failed."

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TREATMENT OF VESICAL CALCULI

Vesical calculi can be extracted through the natural channels with the aid of the direct vision cystoscope, only however, when they are not too large to pass through the urethra. This means that the cystoscope is of service only with small calculi; but with phosphatic calculi, whatever their size, direct cystoscopy stands preeminent.

Treatment of Phosphatic Vesical Calculi

These calculi are relatively frequent and occur mostly in women. At times they develop around a foreign body introduced accidentally into the bladder; at other times, the foreign body may be introduced during some surgical intervention; this may include a fragment of a catheter or bougie, or a thread of catgut fallen into the bladder during the treatment for vesicovaginal fistula, or a pessary which has ulcerated through the vesicovaginal wall.

Occasionally the foreign bodies are introduced accidentally; the long list of such objects includes hairpins, beans, peas, pencils, penholders, sticks of wax, pins, pipe-stems, etc.[1] Even in a short time they may become encrustated by calcareous deposits; and after a certain period they are found covered by a turtle-shell thickness which hides them completely.

Phosphatic deposits may develop even without preexisting foreign

bodies by simple precipitation of salts in a very concentrated alkaline urine. As a rule they are the result of improper alimentary hygiene; or they may be secondary to an intense and prolonged cystitis. When they develop in a previously healthy bladder, they cause an irritation of the mucosa, producing a severe and painful cystitis. These phosphatic deposits often adhere to the vesical mucosa to such a degree that they can not be removed without tearing fragments of the mucosa along with them; they look like real stalactites.

The presence of these deposits can be determined by an ordinary

Fig. 215.—View of a phosphatic calculus seen through Luys' direct vision cystoscope.

explorer or metallic searcher; but the surest way is to see them through a cystoscope. After they have been found, there are three methods of treatment: Lithotrity, suprapubic cystotomy and simple curettage through the natural channels; but all three methods present serious disadvantages.

Crushing is insufficient. The fragments of calcareous encrustation which are adherent to the mucosa, are frequently too small to be grasped between the jaws of the lithotrite; often they are also soft, which makes it very difficult to seize them even with the most careful searching of the instrument.

They can undoubtedly be removed through cystotomy; but the operation is out of all proportion to such a benign ailment, especially when we consider the frequent recurrences of these deposits. It would be absurd to advise another cystotomy for each recurrence.

Curettage through the natural channels is done blindly; fragments are liable to remain in the bladder, thus injuring the healthy vesical mucosa.

The real treatment is their extraction under the control of the eye, through the direct vision cystoscope. This method is radical, because it enables the operator to extract everything; it is simple, because general anesthesia is not required; and the patient can continue his usual occupation immediately after the intervention; lastly, it is absolutely without danger.

The technic is simple: The cystoscope is introduced into the bladder and the deposits are readily located in the form of calculi of shining white color and various shapes,—round, oval, pointed, stalactite. A forceps (Fig. 210) is introduced through the cystoscopic tube, grasps the fragments and withdraws them (Fig. 216).

In certain cases there is but one calculus; this is seen when the deposit covers a foreign body. Sometimes they are multiple, either mobile or fixed to the mucosa or encysted. For the latter, the direct cystoscope is especially serviceable. With this instrument the entire surface of the mucosa can be examined systematically, and the calculi can be removed, one after the other, with the aid of forceps and with the minimum injury to the vesical mucosa.

The smallest and most adherent fragments are easily detached and grasped by the forceps. Sometimes a small tampon of cotton attached on a probe is sufficient to detach and extract small fragments which are very friable; this converts the deposits into an actual phosphatic pulp.

When the fragments are hard and small, they can be extracted through the tube. When they are larger than the lumen of the tube, they can be grasped by the forceps and both tube and forceps are withdrawn at the same time. When the calculus is too large, it may not be able to pass through the vesical neck. In these circumstances, because of its size, it is easily located by the lithotrite, which breaks it into small fragments; the latter are then located by the cystoscope and extracted without difficulty.

The postoperative steps are extremely simple: Copious vesical irrigations with hot boric solution will control any possible bleeding. There is no necessity of leaving a catheter in the bladder for drainage. The patient goes home, takes large quantities of warm liquid,

and urotropin is prescribed; no other treatment is necessary. Six to ten days later cystoscopy will be required to verify the result.

I have often had the opportunity of applying this method of treatment. All the cases are remarkable for the simplicity of the operation and the excellent results obtained. They occur almost invariably in women about forty years of age, who complain of frequent urination, cloudy and occasionally bloody urine. The pollakiuria is sometimes

Fig. 216.—Extraction of a phosphatic calculus through Luys' direct vision cystoscope.

very severe, compelling the patient to void every ten minutes, and the pain after urination is very acute. With the above mentioned treatment, the pains disappear very rapidly and the vesical capacity advances rapidly from 20 to 80 and even 150 c.c. The cure is materially aided by the local application of a 5 or 10 per cent nitrate of silver solution through the cystoscope, to the points on the mucosa where the calculi were implanted.

Two cases are particularly interesting and worth reporting. One was that of a woman, aged fifty-five years, with an extremely acute cystitis and numerous phosphatic concretions. On a previous occasion, in February, 1908, I extracted a great number of phosphatic masses, with the aid of forceps. In July, 1909, I repeated this procedure more thoroughly; all the calculi were extracted and the patient was completely relieved. These calculi were examined by Carrion, and he found they consisted of phosphates of ammonia and magnesium. Since then I have applied this treatment to other cases.

The following case is also of particular interest.

A woman, aged thirty years, was referred to me by Gauja, on May 17, 1912. For three months she carried in her bladder the head of a Pezzer catheter. During a difficult confinement, four months previously, her perineum was torn, and sutured; an attempt was then made to introduce a Pezzer catheter but its tip fell off into the bladder. The urine became cloudy and the microscopic examination of the centrifuged deposits showed the presence of pus and blood.

Cystoscopy revealed the presence of a white calculus, in the shape of a mushroom, vaguely resembling in outline the tip of the catheter. On May 21 this was extracted. The cystoscope was introduced easily and the forceps directed toward the calculus; the latter being smooth could not be grasped, and moreover, even when I succeeded in seizing it with forceps, it could not be extracted because it was too large to pass through the urethra. Then a lithotrite was introduced and the calculus was caught and crushed into small fragments. The cystoscope was again introduced, the fragments were extracted, and among them, portions of the catheter head were readily recognized.

The operative results were uneventful. On May 24 the patient was completely cured; the urine was clear; the cystoscope did not reveal any trace of calculi or any other abnormality of the bladder. In this particular case, one might have thought crushing alone would have been sufficient; but the soft fragments of the catheter could not be seized in the jaws of the lithotrite and they might therefore have become the nuclei of new calculi.

Another remarkable and interesting case is that reported by Pulido-Martin, of Madrid.[2]

"Mrs. R. L., aged thirty years, married, mother of three healthy children; no pathologic history, normal menses, no miscarriages. For a year and a half, she had noticed that her urine was bloody, independently of her menstruation or pregnancy; and without any appreciable cause. Becoming alarmed, she consulted a physician, who prescribed a hemostatic. Several days after the onset of this attack, urination became frequent with pain at the end of the act; these pains became continuous as the frequency increased. The urine when examined, was purulent and alkaline, with numerous phosphatic deposits. The patient then consulted Angel Bueres, a distinguished Asturian specialist, who cystoscoped her under most unfavorable conditions. The capacity of the bladder was not more than 60 c.c.; the blood, the pain and the movements of the patient made a definite diagnosis well-nigh impossible. Nevertheless he was able to distinguish a white mass at the trigone, extending toward the left side. As the vesical capacity could not be increased and the pains persisted, my excellent colleague and friend referred the patient to me.

"She was a large, stout, pale woman, of lymphatic aspect, who seemed tired out by the repeated and persistent pains which she had suffered. She voided every fifteen or twenty minutes, day and night; urination was very acutely painful, especially toward the end; occasionally she had attacks of acutely painful vesical colic, when she voided large phosphatic concretions covered by fragments of necrotic mucosa and glary mucus. The urine was strongly

alkaline and contained a large number of cocci and bacilli, from which the tubercle bacillus could not be isolated. The travel and the lack of treatment had reduced the vesical capacity to 40 c.c.

"As indirect cystoscopy was thus impossible, I introduced Luys' direct cystoscope, and saw a whitish mass at the trigone, having the appearance of the core of a furuncle. Numerous granulations of phosphatic salts were spread irregularly over the mucosa, and contrasted vividly by their color with the rest of the necrotic tissues. The mucosa was ulcerated in some places and the rest of the bladder was very red.

"At first I extracted a few concretions with Kollmann's forceps and irrigated the bladder lightly. This treatment was repeated in three or four days. After this the number of concretions diminished and patient improved. Then I instituted the following systematic treatment: The patient was put in the Luys' cystoscopic position, the cystoscope was introduced and fragments of necrotic tissue and concretions were extracted with Kollmann's forceps. Then the white surface was swabbed with sterile absorbent cotton on a probe, and the parts were then touched up with a 3 per cent silver nitrate solution on another probe, this being followed by a bladder irrigation. The treatment was painless, without local anesthesia, and without hemorrhage, and the patient continued her active social life without a single day's interruption.

"The bladder condition improved at the beginning slowly, then more rapidly, so that in one month the capacity had increased from 40 c.c. to 200 c.c.; the pains had disappeared, the urine became clear and recovered its normal reaction. Cystoscopy in a fluid medium with indirect vision showed that the ulceration, which had been covered by necrotic masses, encrustations and numerous microbic organisms, had diminished to such an extent that it occupied a little round space the size of a cent. This ulcer was situated above the trigone, toward the right side, but at some distance from the right ureteral orifice; in its center, was a small phosphatic deposit corresponding to a small wound situated on the anterior wall of the bladder; this wound was oblong in shape with its long diameter situated vertically; the transverse diameter was the same size as the ulcer on the posterior wall of the bladder. It was certainly produced by friction of the encrustated ulcer of the posterior wall with the mucosa of the anterior surface. The posterior ulcer having been treated locally was quickly cured, while the nonencrusted wound of the anterior wall, which was not directly treated, took a long time to cicatrize.

"The only drugs taken internally during this treatment were uraseptin and a diuretic infusion. When the bladder capacity had become normal, and the urine clear, a functional test of the separate kidneys was made; and as I expected, I found the urine perfectly normal. The kidney function was slightly retarded and elimination seemed less rapid than in perfectly healthy kidneys. The patient has been feeling well since then—I hear from her every two or three weeks— and has thus been made rid of a rebellious and painful illness in little longer than a month and a half."

Still another case, also very interesting, is reported by E. Escomel, of Aréquipa, Peru, as follows:[3]

"A woman, aged forty-eight years, presented herself for consultation for urinary frequency, vesical tenesmus and cloudy urine, covering a period of several months.

"Clinical examination revealed a painful bladder; vaginal examination, negative. The patient voided ten to fourteen times during the twenty-four hours, the total quantity never exceeding 1600 c.c. Vesical capacity was 200 c.c., and when that limit was reached she had an imperious and almost painful desire to void. Microscopic examination of the urinary sediment showed many leucocytes, bladder cells, a few urethral and ureteral epithelial cells, and numerous small cocci. Earthy phosphates were also present.

"Cystoscopy with Luys' instrument, the use of which I had learned from its inventor himself, revealed a chronic catarrhal cystitis and a small soft, phosphatic calculus, firmly fixed and encrustated at the bladder fundus and partly enveloped by the mucosa.

"The calculus was grasped and broken up with an endovesical forceps. I have the fragments in my surgical collection. I curetted the mucosa, completely extirpating all the embedded fragments with a small curette that could easily pass through the cystoscopic tube. The small vesical wound was swabbed with 3 per cent silver nitrate solution, the cystoscope withdrawn and the bladder irrigated with a solution of protargol 1:1000, using a large catheter. The irrigations of the bladder were continued for several days, with oxycyanide of mercury solution, 1:4000; urotropin internally.

"The after effects were uneventful. The old cystitis improved very rapidly. Cystoscopy was repeated twenty days later, and the ulceration caused by the calculus was cicatrized. The rest of the mucosa was pale and in fine condition. Microscopic examination of the urine showed no cocci nor leucocytes. The patient was then referred to the hydromineral station at Jesus, near Aréquipa, the waters of which are specific for urinary calculi. The patient returned completely cured."

Two other cases, reported by Ferron,[4] also show the facility with which fragments of calculi can be extracted through the direct vision cystoscope. In one case a woman, aged fifty-seven years, in the service of Pousson, was operated upon for a vesical calculus by lithotrity. The operation was done without undue incident, but a few days later, she developed a rise in temperature, the bladder became painful and could not tolerate the irrigations.

Under direct vision cystoscopy, four fragments of calculus and a large quantity of inspissated pus were removed. On the same day the temperature dropped to normal and remained so, and the symptoms of cystitis rapidly disappeared.

The second case is that of a man sixty-eight years old, with numerous calculi of relatively small size. Ferron, using the direct cystoscope, removed twenty-four calculi in two or three sittings; the two last calculi being somewhat larger, necessitated meatotomy.

It can thus be seen how serviceable this method really is, inasmuch as it made possible the removal of a calculus of 1½ cm.

Conclusion: Considering the results mentioned in the preceding reports, it may be concluded that direct vision cystoscopy is distinctly indicated in all cases of foreign bodies in the bladder without exception, both in the male, as well as in the female. This is the only method which makes the extraction of foreign bodies possible under the most favorable conditions and in the shortest time.

The size of the foreign body is not a contraindication against this method, because, as has already been shown, a hairpin, 7½ cm. long, can be removed by this method. In the case of a calculus, preliminary crushing will enable us to remove all the fragments without overlooking any. Finally, this method conforms with that principle of all rational surgery which demands that the lesion shall be seen both before and during the treatment.

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[4]Ferron: Thesis of Jardon, p. 65; also Calculs vésicaux et Cystoscopie à vision directe, Jour. d'urol., 1913, iii, p. 319.

TREATMENT OF CYSTITIS

At the present day, it is generally admitted that inflammation of the vesical mucosa in the vast majority of instances, is the result of an inflammation of some adjacent organ, and that the so-called idiopathic cystitis does not exist as a real entity. Nevertheless, the painful symptoms of cystitis constitute a pathologic ensemble which is important enough to demand an appropriate local therapy. This important fact that cystitis is a secondary lesion, must control our general direction of the treatment of cystitis.

It is therefore essential to know the causes which underlie the cystitis, before we can apply the treatment. There are three principal causes: Renal, inflammation of adjacent organs and foreign bodies.

1. **Cases of Renal Origin.**—This is the most frequent cause of cystitis. In these cases treatment applied to the bladder will never be able to counteract the action of the urine which is continually coming down from the diseased kidney, loaded with microbes and pus, thus irritating the bladder and producing the inflammation.

2. **Inflammation of Adjacent Organs.**—In the male, inflammation of the prostate and seminal vesicles is one of the most frequent causes of cystitis. In the female, gonorrheal and tuberculous inflammation of the uterus, tubes, and adnexa, is one of the most common causes.

But the organs in the immediate vicinity of the bladder are not the only causes of cystitis. Pelvic abscess may attack the bladder; a purulent collection in the appendix may perforate the bladder; a cancer of the rectum or of the vagina or a cold abscess of the vertebral column may rupture into the bladder.

3. **Foreign Bodies.**—Foreign bodies remaining in the bladder for some length of time, will produce inflammation, whether they be endogenous, like calculi, or exogenous, of infinite variety (see page 357).

The diagnosis of cystitis can really be made only through cystoscopy, much better than through the three cardinal symptoms of every classic textbook, namely, pain, frequency, and pyuria.

In cystitis, indirect cystoscopy is markedly inferior to the direct method. First, because the affected bladder will not tolerate a proper distention by the fluid, owing to the painful contraction of the walls and the hemorrhage which it produces. A bladder with cystitis is very sensitive to the slightest contact; indirect cystoscopy is therefore uncomfortable both for the patient and the surgeon.

Another disadvantage is found in the fact, already mentioned above, that it is impossible to apply appropriate local treatment at will, even though the lesions have been distinctly isolated.

Direct vision cystoscopy eliminates all these disadvantages and gives the best results. In the first place, there is no minimal vesical capacity for my direct vision cystoscope; the bladder dilates normally, without being forced, and consequently without pain. Usually pain is felt only when the tube enters the bladder, owing to the inflammation of the vesical neck. This little disadvantage can be easily overcome by the employment of local stovaine anesthesia. But once the instrument has entered the bladder, the best results can be obtained.

It goes without saying, that in cystitis as in urethritis, it is highly inadvisable to apply local treatment to the mucosa as long as it is acutely inflamed; when this condition has receded through the use of proper medication, the direct vision cystoscope can be used with telling results. In these circumstances, cystoscopy shows that the mucosa is inflamed in certain spots, while the rest of the bladder is normal and devoid of any lesion; red and bloody patches of severe cystitis can be seen adjoining the pinkish white healthy mucosa. It may thus be seen how irrational it is to apply active medicinal substances to the healthy mucosa as well as to the diseased parts simultaneously. The rational method is to treat the diseased areas vigorously and actively, omitting the healthy portions. This can be accomplished by the use of the direct vision cystoscope, through which it is possible to treat the diseased portions by the cautery or the silver stick, while the healthy parts are not interfered with at all.

Operative Technic in the Treatment of Localized Cystitis

The operative technic of the treatment of cystitis with the direct vision cystoscope is the same as that used in direct vision cystoscopy in general. The entire mucosa having been examined and the lesions localized, the end of the tube is brought directly in contact with them. The mucosa is then cleaned with a swab of sterile cotton, in order to obtain a more intense action of the drug to be employed. The mucosa having thus been dried, concentrated solutions appropriate to each particular case, are then used.

In gonorrheal cystitis very marked results are obtained by the use of local applications of 5 to 10 per cent silver nitrate solution; occasionally the pure silver stick may be used with success. In the form of chronic cystitis which is frequently observed in women, due to a high degree of concentration of the urine, the lesions are localized; they are well shown in Plate XII, Fig. 3. In these cases, the silver applied locally to the affected parts, gives absolutely remarkable results.

Innumerable cases have been reported with the most conclusive results. When a cystitis has had a long duration, or when the extremely thickened mucosa presents indurated areas at certain points of its surface, it may be mistaken for a neoplastic proliferation. In these conditions, 10, 20, or even 50 per cent solutions of resorcin may be used with gratifying results. It goes without saying, of course, that much care must be taken in the use of such concentrated applications, lest they spread to the surrounding healthy tissues. To prevent this possible spreading of the solution, it is safer to dry the mucosa after the application of the caustic has been made.

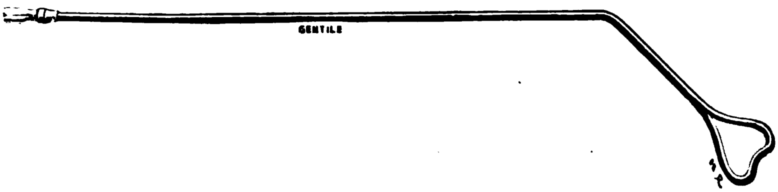

Fig. 217.—Silver nitrate stick for endovesical cauterization.

In some instances, the galvanocautery may be used, but its application must be extremely superficial, and made very gently. Under these precautions they are both painless and effective.

Reports of cases of cystitis cured with the direct vision cystoscope are innumerable; only a few will be mentioned here.

In one instance, a cystitis developed subsequent to the opening of an abscess near by; it was wonderfully improved by the application of silver nitrate to the affected surface. Only a few applications were required to produce this excellent result.

In a second case of cystitis, due to perforation into the bladder of an abscess secondary to Pott's disease, local treatment with the cystoscope gave a most happy result.

In tuberculous cystitis which is usually so rebellious to treatment, direct view cystoscopy can be of particular value. In the vast majority of cases, this tuberculous cystitis is secondary to a tuberculous inflammation in the corresponding kidney; the real treatment of unilateral

renal pyonephrosis is of course, nephrectomy. Nevertheless, very painful symptoms of cystitis persist as a rule, long after this operation, and in such cases direct vision cystoscopy gives most splendid results.

Applications of tincture of iodine, silver nitrate, concentrated solutions of lactic acid, or the actual cautery, are usually painless and highly effective.

Ferron has published[1] reports of two interesting cases, on this subject.

CASE 43.—A woman, aged twenty-six years, had a right nephrectomy performed on July 17, 1909. After the operation, although her physical condition was good, she still complained of vesical symptoms. Local treatment with the direct cystoscope gave most excellent results in a short time.

CASE 41.—This case is very conclusive. A woman, aged thirty-three years, was nephrectomized for a left renal tuberculosis, on August 2, 1910. After the operation, she still had symptoms of tuberculous cystitis; this condition was treated according to Luys' method. The improvement was rapid and a guinea-pig inoculation in 1910 was negative. Before the treatment, the patient had voided every five minutes by day, and had incontinence by night; after treatment diurnal micturition became normal, and there was no call to void at night. Her vesical complaint was perfectly cured.

Paul Jardon has stated[2] that direct vision cystoscopy is indicated in all cases of cystitis; it assures a thorough examination of the bladder and makes possible a rational treatment of the lesions.

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[2]Jardon: De la cystoscopie à vision directe, Bordeaux, 1912, pp. 44 and 45.

INSTRUMENTAL EXPLORATION OF THE INFERIOR EXTREMITY OF THE URETER

Thanks to the cystoscope, the inferior end of the ureter can be examined in the same manner as we examine the urethra. For this purpose Kelly[1] used a slightly curved blunt probe which he called a "searcher." Jeanbrau utilizes a metallic explorer with a flexible shaft for extraperitoneal ureterolithotomy. Ferron[2] also uses metallic instruments consisting of a flexible shaft ending in a No. 7 or 8 bulb, and similar to Guyon's ureteral explorers. Pasteau has constructed ureteral explorers of rubber, similar to Guyon's instruments.

The caliber and condition of the ureter can be ascertained with any of these instruments. The technic is the same as that in urethral exploration. When the instrument is arrested at a given point, it is an indication of the presence of an obliteration, a kink, a tight stricture, or a calculus. When, on the other hand, a fine instrument passes be-

yond an obstruction but presents a sudden relaxation and free movement on being withdrawn, a stricture may be taken for granted.

This method of examination is also occasionally employed for the extraction of a calculus or a foreign body from the ureter. I have tried dilatation of the ureter in a woman with a ureteral calculus, in Pozzi's service. I introduced a bougie into the ureteral orifice and left it in place for twenty-four hours, to bring about dilatation. The attempt was unsuccessful, because the calculus was embedded in and adherent to the mucosa, and could not be moved. It was subsequently extracted through a subperitoneal laparotomy.

Other foreign bodies can likewise be extracted from the ureter by means of a fine forceps. Thus, I was once called upon to extract a ureteral catheter from the bladder, in one of the largest surgical services in Paris. During the course of an exploratory laparotomy, contrary to all expectation, a large calculus was discovered in the right ureter. The calculus was removed, the ureteral wall sutured and a catheter introduced into the lower end of the ureter for urinary drainage. The catheter was deemed long enough to extend into the interior of the bladder.

I was therefore called upon, several days after the operation, to remove the catheter, which was thought to be in the bladder. To my surprise, I found the bladder absolutely empty, without any trace of a ureteral catheter. But the ureteral orifice was extremely puffy. A small forceps was introduced into the ureter, but nothing was felt. It was then believed that the catheter had remained in the ureter and had not descended into the bladder. Another operation was therefore subsequently performed; the lower extremity of the kidney was exposed and the pelvis incised. The catheter was found at the upper end of the ureter. It was immediately removed, and the patient made an uneventful and perfect recovery.

Apart from the exploration of the ureter *per se,* another indication for ureteral catheterization, of the greatest importance, is the insertion of a catheter into the ureter, before operating upon the ureter or upon one of the adjacent organs, so as to be able to identify and protect the ureter.

Endoscopic uretero-vesical meatotomy for the removal of a calculus from the ureter in a female, was reported by Gauthier, of Lyons,[3] as follows:

"C., aged thirty-seven years, entered the Hotel-Dieu Hospital of Lyons, on April 20, 1912, in the service of my teacher and friend, Tixier, for chronic and persistent nephritic colic. No hereditary urinary history; father died of pulmonary tuberculosis.

"Personal history: It seems that about ten years ago, she suffered from a gastric

ulcer, for about three or four years. This was subsequently cured. For the past three years, she has complained of pains in the left lumbar and right iliac regions. The lumbar pains are the more severe; these are real attacks of renal colic, occasionally lasting twelve hours and coming on almost at weekly intervals during recent months. The pains in the right side are continuous, with exacerbations from time to time. During these crises they radiate toward the corresponding thigh, which appears as if paralyzed for the time being. During these iliolumbar attacks, she also complains of vesical symptoms; i. e., increased frequency and cystalgia. When the crises have subsided, the bladder is quite normal.

"She never passed any calculi or gravel. At the beginning of her illness she had a few attacks of hematuria, but it is difficult to determine their character. The patient has lost much flesh and strength; her appetite is poor.

"Examination: General condition fair; no fever; lungs and heart normal. The urine is not clear, and contains leucocytes, urinary epithelium, and a few red blood cells. A large albumin ring is out of all proportion to the pyuria. Palpation of the kidneys and ureters reveals the following painful areas: On the right side, costolumbar and upper middle ureteral; on the left side, the costolumbar and middle ureteral. The inferior pole of the right kidney is palpable and sensitive; the left kidney can not be felt.

"Vaginal examination reveals a metritis of the neck and a moderate vesical prolapse. A hard mass is felt distinctly in the left lateral vaginal cul-de-sac. This mass is about the size of a small kidney bean, and is continued upward and outward by a thick elastic and resistant cord, having the caliber of a No. 18 rubber catheter.

"It is evident that this cord is the ureter and that the hard mass is a calculus embedded in this canal. The diagnosis seems to be quite certain according to the examination. This is a case of double renoureteral lithiasis. Radiography of the entire urinary tract shows a localized lithiasis of tho right kidney and left ureter. There are no stones in the left kidney or the right ureter. In the right kidney, a large shadow is clearly seen, the size of an ordinary plum. Three distinct shadows are seen in the left ureter. The lowest corresponds exactly in size with the kidney bean found on vaginal examination; the others are about half its size. Cystoscopy showed a normal bladder. The left ureteral orifice, though slightly red, is not larger than the right. The ureters were not catheterized.

"We decided to attack the right kidney first, rejecting external ureterotomy at once. Operation, May 6, 1912 (Tixier). The calculus is distinctly felt in the renal pelvis, and is removed by pyelotomy, notwithstanding its large size. It weighs 16 gms., and is uratic in appearance.

"The results of the operation are excellent; no fever, maximum temperature being 100.6° F. Urinary escape ceased in eight days, and total closure of the wound in fifteen days.

"On the eleventh day, violent nephritic colic, with temperature of 104° F. and oliguria. For four days the temperature varied between 102.2° and 104°. Sharp lumboiliac pains, scanty urine; then sudden defervescence and disappearance of the pains and increase in the quantity of urine passed.

"After 48 hours of normal temperature, left ureteral catheterization (on May 22), in order to ascertain the exact position of the lower ureteral stone. We attempted to remove it through the natural channels. An obstacle is encountered about 4 cm. from the uretero-vesical orifice. A No. 13 catheter is introduced to a distance of 15 cm. About 250 c.c. of cloudy renal urine are thus evacuated. The urine contains a few leucocytes, many crystals and a little albumin. The high fever coincident with the attack of left renal colic can not be explained by the retention of the septic urine. The urine retained in the kidney can not be considered purulent because it contained but a few leucocytes.

"On May 23, two days after the catheterization, instead of the improvement we expected, the colic and temperature (102.2° F.) reappear. Radical operation is decided upon. Before the external ureterotomy, we will attempt removal of the large lower stone through the natural channels. Transverse splitting of the orifice and the ureter will be tried endoscopically. This will be followed by combined traction through the bladder and rectum, to bring the calculus into the bladder.

"May 25, endoscopic operation (Gauthier). Patient is placed in the inclined position and etherized. The urethra is dilated and Luys' cystoscope, measuring 14 mm. in diameter is introduced. The left ureteral orifice is seen readily. This is catheterized with a rubber conductor, No. 4 Charrière and Maisonneuve, 5 cm. in length, screwed upon a straight tunneled metallic Maisonneuve conductor. The entire rubber conductor (carrier) is inserted into the ureter, between the ureteral wall and the stone. About 3 cm. of the metallic conductor is passed into the ureteral orifice. A Maisonneuve No. 2 knife is then engaged in the groove of the conductor and advanced toward the meatus. The orifice is then split under the control of the eye; nothing has been done in the dark, thanks to the large lumen of the cystoscopic tube. The blade is advanced until its summit disappears in the vesical mucosa. Hemorrhage is moderate.

"All the instruments are now removed from the bladder. The urethra is dilated up to 18 French. The left index finger is introduced into the bladder, the right into the rectum. Both fingers feel the stone distinctly grasping it and drawing it into the bladder, whence it is extracted. The operation is ended; it has lasted about fifteen minutes. The calculus, has the shape of a date seed, and weighs 0.80 gm.

"On the following day, a second stone, weighing 0.35 gm. is spontaneously eliminated. On the third day, a third stone is passed, weighing 0.15 gm. Thus the patient is made rid of the three stones revealed by the x-ray.

"Permanent apyrexia is attained on the eighth day. The quantity of urine increased enormously after the relief of the left kidney. She passed from 200 to 400 c.c. on May 29, and more than two liters during an entire week.

"On June 8, albuminuria disappeared. On the same day it was found that the length of the left ureteral orifice is five to six mm. No definite trace of the incision can be seen. The bladder is normal, not inflamed. A catheter No. 14, penetrates the left ureter easily, for about 25 cm. There is no pyelitic residuum. The pelvic capacity is 45 c.c. The patient left the hospital in perfect condition.

"On August 24 she was seen again. She complained of left lumbar pain principally at night. There is a certain relationship between these pains and her digestion. The pains are diminished perceptibly on a restricted diet. She also has acid eructations and epigastric inflation after meals and frequent headaches.

"The general condition is improved; she has gained thirteen pounds since leaving the hospital. The urine is clear; no albumin. Palpation of the kidneys and ureters is not painful. Left catheterization is negative. Appropriate diet is prescribed for the dyspeptic trouble.

"September 27, the patient writes that her left lumber pains have nearly disappeared under the regulation of diet."

Conclusions.—Ureteral stricture often obstructs the passage of a ureteral stone. When the calculus can be moved, ureterotomy is indicated. This is easily done in women through the natural channels, using Maisonneuve's straight urethrotome, introduced through Luys' 14 mm. cystoscope. The operation must be done cautiously, avoiding the periureteral venous plexus; it is also imperative to avoid cutting the bladder proper. If this method fails, external ureterotomy can always be resorted to.

Ferron also has reported an interesting case, which shows the considerable value of dilatation of the inferior extremity of the ureter for the establishment of the free urinary flow from the kidney.[4]

"A girl aged eighteen years, suffering from gonorrheal cystitis, complained of pain

in the lumbar region. Bimanual examination revealed pain on the right side, although the kidney was not perceptible. The cystitis was treated locally through Luys' cystoscope and improved rapidly.

"Examination of the ureteral orifices then became possible. The left orifice was found normal, but the right orifice was the size of a pin point, and too small to permit the entrance of the smallest catheter. The ureteral ejaculation on this side occurred in the form of a filiform-sized jet.

"The extremity of the cystoscopic tube in contact with the neck, we were enabled to demonstrate to the gathered students of the service, that a filiform jet of urine, emerging from this orifice, shot across the cystoscopic field and struck the anterior wall of the bladder, although the viscus was distended with air. This orifice was dilated with filiform bougies, in a few sittings. Catheterization became easy, and the two hour test revealed a normal kidney. The patient was kept under regular observation but never complained again. We believe her former pains were due to the ureteral stricture."

Bransford Lewis[5] also favors the extraction of ureteral calculi through the natural channels. He either dilates the ureteral orifice or he grasps the calculus with a crocodile forceps fitted upon a flexible handle. He introduces it into the ureter, advances it up to the calculus, grasps it and gently withdraws it. He thus removes ureteral calculi even in the male.

[The editor[6] reported a case of calculus impacted in the ureteral orifice in a young man. Indirect cystoscopy showed a jagged point of the stone projecting beyond the ureteral orifice into the bladder, but held tightly. It was seized by an operating forceps, and though the projecting tip broke, the remainder of the calculus was grasped within the lumen of the ureter, at the same sitting, and withdrawn from the bladder. There has been no recurrence since then.—EDITOR.]

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VESICAL BIOPSY

Histologic examination of fresh specimens of vesical tumors is of great importance in making a diagnosis; this desideratum is realized in a very simple and perfect manner with my direct vision cystoscope.

In two cases, this procedure has given me signal results. A woman, aged sixty-two years, whom I nephrectomized for left renal tuberculosis two years previously, came to me with hematuria. Cystoscopic examination of the bladder showed a number of budding masses.

Considering the age of the patient, these bodies might have been considered epitheliomatous in character.

Histologic examination of fragments removed through the cystoscope, revealed only simple inflammatory nodules, due to a concentrated tuberculous cystitis. Local applications of a concentrated solution of lactic acid were followed by excellent and rapid results.

Another case, a man, aged sixty-five years, presented a small tumor on the left lateral wall of the bladder behind the ureteral orifice. Microscopic examination of a fragment of tissue revealed a vesical epithelioma. The history of this case is reported in detail in connection with the application of radium in vesical tumors (page 355).

Vesical biopsy should be resorted to as often as possible, for the establishment of a correct diagnosis; its splendid results can be best appreciated by anyone using the direct vision cystoscope for this purpose.

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